

# MARKING SCHEME

2010

CLASS XII  
SCIENCE SUBJECTS



CENTRAL BOARD OF SECONDARY EDUCATION  
DELHI

# MARKING SCHEME

2010

CLASS XII  
SCIENCE SUBJECTS



CENTRAL BOARD OF SECONDARY EDUCATION  
DELHI

CBSE, Delhi-110301

October, 2010 : 200 Copies

Price : Rs.

Manuscript as such highlights the main value points and does not represent a complete ideal answer.  
Manuscript may vary from time to time and year to year.

Published by Secretary, C.B.S.E. 'Shiksha Kendra', 2, Community Centre, Preet Vihar, Delhi - 110301.  
Laser typesetting and Printed by Akashdeep Printers, Daryaganj, New Delhi - 110002

## PREFACE

CBSE as a pace setting national Board has constantly been striving to design its evaluation process in a manner that it is used as a powerful means of influencing the quality of teaching and learning in the classroom situation. Also, it has to be so designed that it provides constant feedback regarding the effectiveness of the course content, classroom processes and the growth of individual learners besides the appropriateness of evaluation procedures.

As a move in this direction, CBSE started the practice of publishing the Marking Schemes with twin objectives in mind-(i) making the system more transparent and at the same time, (ii) ensuring high degree of reliability in scoring procedure.

Who are the markers of answer scripts? How do they mark the answer scripts? How can it be ensured that marking is fair, objective and reliable? Questions of these types naturally arise in the minds of candidates appearing in the public examination. These questions are equally pertinent to the teachers who are not adequately exposed to the CBSE system of marking.

Answer Scripts marking is a specialised job. It is assigned to teachers-PGTs for Class XII and TGTs for Class X who are in direct touch with the subject and have a minimum of 3 years experience of teaching the subject at that level. Appointment of examiners is made in accordance with the well-defined norms. Markers examine scripts with the help of detailed guidelines called the 'Marking Schemes'.

It is this tool (Marking Scheme) alongwith the extensive supervisory checks and counter-checks through which CBSE tries to ensure objective and fair marking. The present publication is being brought out with a view to serving the following objectives :

- (i) To give an opportunity to the teachers and students to look into the Marking Schemes that were developed by the Board and supplied to the evaluators in 2010 main examination in some selected main subjects.
- (ii) To receive feedback and suggestions from institutions/subject teachers on the utility and further improvement of Marking Schemes.
- (iii) To encourage institutions to undertake similar exercise of developing marking schemes for classes other than those covered by the Board's examination with a view to increasing teachers' responsiveness to them as the essential tools of evaluation.

## HOW TO USE

Teachers and the students preparing for Class XII examination of the Board constitute the primary interest-group of this publication. Marking Schemes of Question Papers in the subjects of English Core, Functional English, Mathematics, Physics, Chemistry, Biology, Bio-Technology, Informatics Practices, Computer Science and Engineering Drawing administered in Delhi and Outside Delhi during the 2010 main examination have been included in this document. Some tips on their usage are given below :

### (a) To Teachers :

- Go through the syllabus and the weightage distribution for the subject carefully.
- Read the question paper to find out how far the question paper set subscribes to the prescribed design. Grade every question by difficulty level for students who have taken the main Board examination.
- Consult the 'Marking Scheme' for each question, with reference to steps into which answers and awards have been divided.
- Work out concrete suggestions for the Board.

### (b) To Students :

- Study each question carefully, comprehend them and write down the main points of the answer and note down their difficulties for clarification.
- Examine a question in conjunction with the Marking Scheme and find out the proximity of the answer to that suggested in the Marking Scheme.
- We will feel motivated if this publication is commented upon by practitioners in the context of its impact on their teaching learning strategies. Contribution of the experts and the officials of the Board in bringing out this document is gratefully acknowledged.

We urge the teachers to encourage their students to make use of this publication and at the same time to enrich us with their free and frank reactions.

**M.C. SHARMA**  
CONTROLLER OF EXAMINATIONS

# भारत का संविधान

## उद्देशिका

हम, भारत के लोग, भारत को एक ' [सम्पूर्ण प्रभुत्व-संपन्न समाजवादी पंथनिरपेक्ष लोकतंत्रात्मक गणराज्य] बनाने के लिए, तथा उसके समस्त नागरिकों को:

सामाजिक, आर्थिक और राजनैतिक न्याय,  
विचार, अभिव्यक्ति, विश्वास, धर्म  
और उपासना की स्वतंत्रता,  
प्रतिष्ठा और अवसर की समता

प्राप्त कराने के लिए,  
तथा उन सब में,

व्यक्ति की गरिमा और ' [राष्ट्र की एकता  
और अखण्डता] सुनिश्चित करने वाली बंधुता

बढ़ाने के लिए

दृढसंकल्प होकर अपनी इस संविधान सभा में आज तारीख 26 नवम्बर, 1949 ई० को एतद्वारा इस संविधान को अंगीकृत, अधिनियमित और आत्मार्पित करते हैं।

- 
1. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977) से "प्रभुत्व-संपन्न लोकतंत्रात्मक गणराज्य" के स्थान पर प्रतिस्थापित।
  2. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977 से), "राष्ट्र की एकता" के स्थान पर प्रतिस्थापित।
- 

## भाग 4 क

### मूल कर्तव्य

51 क. मूल कर्तव्य - भारत के प्रत्येक नागरिक का यह कर्तव्य होगा कि वह -

- (क) संविधान का पालन करें और उसके आदर्शों, संस्थाओं, राष्ट्र ध्वज और राष्ट्र गान का आदर करें;
- (ख) स्वतंत्रता के लिए हमारे राष्ट्रीय आंदोलन को प्रेरित करने वाले उच्च आदर्शों को हृदय में संजोए रखें और उनका पालन करें;
- (ग) भारत की प्रभुता, एकता और अखंडता की रक्षा करें और उसे अक्षुण्ण रखें;
- (घ) देश की रक्षा करें और आह्वान किए जाने पर राष्ट्र की सेवा करें;
- (ङ) भारत के सभी लोगों में समरसता और समान भ्रातृत्व की भावना का निर्माण करें जो धर्म, भाषा और प्रदेश या वर्ग पर आधारित सभी भेदभाव से परे हों, ऐसी प्रथाओं का त्याग करें जो स्त्रियों के सम्मान के विरुद्ध हैं;
- (च) हमारी सामासिक संस्कृति की गौरवशाली परंपरा का महत्व समझें और उसका परिरक्षण करें;
- (छ) प्राकृतिक पर्यावरण की जिसके अंतर्गत वन, झील, नदी, और वन्य जीव हैं, रक्षा करें और उसका संवर्धन करें तथा प्राणि मात्र के प्रति दयाभाव रखें;
- (ज) वैज्ञानिक दृष्टिकोण, मानववाद और ज्ञानार्जन तथा सुधार की भावना का विकास करें;
- (झ) सार्वजनिक संपत्ति को सुरक्षित रखें और हिंसा से दूर रहें;
- (ञ) व्यक्तिगत और सामूहिक गतिविधियों के सभी क्षेत्रों में उत्कर्ष की ओर बढ़ने का सतत प्रयास करें जिससे राष्ट्र निरंतर बढ़ते हुए प्रयत्न और उपलब्धि की नई ऊंचाईयों को छू लें।

# THE CONSTITUTION OF INDIA

## PREAMBLE

**WE, THE PEOPLE OF INDIA**, having solemnly resolved to constitute India into a <sup>1</sup> **[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

**JUSTICE**, social, economic and political;

**LIBERTY** of thought, expression, belief, faith and worship;

**EQUALITY** of status and of opportunity; and to promote among them all

**FRATERNITY** assuring the dignity of the individual and the <sup>2</sup> [unity and integrity of the Nation];

**IN OUR CONSTITUENT ASSEMBLY** this twenty-sixth day of November, 1949, do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

1. Subs. by the Constitution (Forty-Second Amendment) Act. 1976, sec. 2, for "Sovereign Democratic Republic (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-Second Amendment) Act. 1976, sec. 2, for "unity of the Nation (w.e.f. 3.1.1977)

---

# THE CONSTITUTION OF INDIA

## Chapter IV A

### Fundamental Duties

#### ARTICLE 51A

**Fundamental Duties** - It shall be the duty of every citizen of India-

- (a) to abide the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (c) to uphold and protect the sovereignty, unity and integrity of India;
- (d) to defend the country and render national service when called upon to do so;
- (e) To promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (f) to value and preserve the rich heritage of our composite culture;
- (g) to protect and improve the natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;
- (h) to develop the scientific temper, humanism and the spirit of inquiry and reform;
- (i) to safeguard public property and to abjure violence;
- (j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.

# CONTENTS

## *Senior School Certificate Examination (XII)*

### Marking Scheme

	Page No.
1. English Core .....	1-38
2. Functional English .....	38-82
3. Mathematics .....	83-120
4. Physics .....	121-173
5. Chemistry .....	174-206
6. Biology .....	207-236
7. Bio-technology .....	237-254
8. Informatics Practices .....	255-301
9. Computer Science .....	302-407
10. Engineering Drawing .....	408-435



**LIST OF COORDINATORS/SUBJECT EXPERTS/REPRESENTATIVES  
OF THE REGIONS FOR UPDATION/FINALISATION OF THE  
MARKING SCHEME FOR THE SENIOR SCHOOL CERTIFICATE  
EXAMINATION, 2010**

<i>S.No. Name of the Coordinator/Subject Experts</i>	<i>S.No. Name of the Coordinator/Subject Experts</i>
<b>ENGLISH CORE</b>	
1. Mrs. Usha Ram Principal Laxman Public School Hauz Khas, New Delhi	7. Smt. P. Dastidar, Principal Army School Narangi, P.O. Satgaon, Guwahati Assam
2. Sh. J.K. Gangal H- 196, Rama Krishna Vihar Patparganj Society Delhi	8. Mrs. Kanti Ramakrishnan Vice Principal Chinmaya Vidyalaya Chennai
3. Dr. Opkar Singh Retd. Prof. 121, Sahyog Appartments Mayur Vihar Phase-I Delhi	9. Mr. S.P. Chand Vice Principal Sutluj Public School Sec.- 4, Panchkula
4. Smt. Vandana Kapoor Principal S.L.S. DAV Public School Mausam Vihar Delhi	10. Mr. D.N.Tiwari PGT Laxman Public School Hauz Khas New Delhi
5. Smt. Kiran Khanna Principal Vivekanand School D- Block, Anand Vihar Delhi	11. Mrs. Bela Batheja, PGT G.D.Goenka School Vasant Kunj, New Delhi
6. Dr. Shyamli Chatterjee Principal A.M.N.B. School Indore (M.P.)	12. Mrs. Harpreet Sahi PGT Delhi Public School Meerut Road, Ghaziabad, U.P.

<i>S.No. Name of the Coordinator/Subject Experts</i>	<i>S.No. Name of the Coordinator/Subject Experts</i>
13. Mr. Naveen Sharma PGT Laxman Public School Hauz Khas Enclave New Delhi	6. Mrs. Lakshmi Srinivasan Principal P.S. Senior Sec. School Mylapore, Chennai Tamil Nadu
<b>FUNCTIONAL ENGLISH</b>	7. Ms. Neena Kaul PGT St.Mary's School B-II Safdarjung Enclave New Delhi
1. Mrs. Annie Koshy Principal St. Mary's School B-II, Block Safdarjung Enclave New Delhi	8. Ms. Babita Sharma India International School Kshipra Path Jaipur (Rajasthan)
2. Mrs. Usha Ram Principal Laxman Public School Hauz Khas, New Delhi	<b>MATHEMATICS</b>
3. Shri P.J. Peter PGT Laxman Public School Hauz Khas, New Delhi	1. Mrs. Anita Sharma Principal S.D. Public School BU Block, Pitampura, Delhi
4. Mrs. Malini Khatri HOD Modern School Barakhamba Road New Delhi	2. Dr. V.P. Gupta Professor NCERT, Sri Autobindo Marg New Delhi
5. Ms. Rita Kapur Principal Delhi Public School Meerut Road Ghaziabad, U.P.	3. Sh. G. D. Dhall K-171, LIC Colony Syed Nangloi Village Delhi
	4. Sh. S.N. Chibber Principal (Retd.) B-330, Saraswati Vihar Delhi

<i>S.No. Name of the Coordinator/Subject Experts</i>	<i>S.No. Name of the Coordinator/Subject Experts</i>
5. Sh. V.P. Singh Retired Principal 2610 A, Street No.9 Bihari Colony Shahdara, Delhi	12. Sh. Ajay Marwaha S.D. Public School BU Block Pitampura, Delhi
6. Sh. J.C. Nijhawan Rtd. Vice Principal C-51 Maharana Pratap Enclave Delhi	13. Sh. J.P. Singh Kendriya Vidyalaya AGCR Colony Delhi
7. Sh. V. Vijay Kumar Principal Jawahar Nehru School Habibganj, Bhopal M.P.	<b>PHYSICS</b>
8. Mr. C. Sathyamurthy Principal Chinmaya Vidyalaya 9-B, Taylore Road Kilpauk Chennai	1. Sh. Suraj Prakash Principal CRPF Pub. School Sec.XIV, Rohini, Delhi
9. Sh. Nirmal Singh PGT Govt. Model Sr. Sec School Sector-35-D, Chandigarh	2. Sh. Bhaskar Ganti Principal Puran Chandra Vidya Niketan Kanpur (U.P.)
10. Sh. R.N. Chaubey Principal JLN Model Sr. Sec. School Digwadih No. 12, P.O. Pathardih, Dhanbad, Jharkhand	3. Prof. V.S. Bhasin B4/46 Paschim Vihar, New Delhi
11. Sh. M.N. Chaturvedi Principal Vivekanand Kendra Vidyalaya Tinsukia Assam	4. Sh. N.K. Sehgal Department of Physics Hans Raj College Delhi University, Delhi
	5. Sh. G. Giri Head Master Modern School Barakhamba Road New Delhi

<i>S.No. Name of the Coordinator/Subject Experts</i>	<i>S.No. Name of the Coordinator/Subject Experts</i>
6. Shri M.D. Gupta Principal Sanatan Dharam Pub. School Road No.10, East Punjabi Bagh, New Delhi	<b>CHEMISTRY</b>
7. Sh. R.S. Thakur Vice-Principal H.E. Vikram Hr. Sec. School BHEL, Piplani Bhopal (M.P.)	1. Sh.S.K.Munjaj Principal St. Margaret Pub. School D-Block Prashant Vihar Delhi
8. Sh. A.K. Mishra Principal Delhi Public School Dhaligaon, Dist. Chirang, Assam	2. Dr. K.N.Uppadhyay, 326 SFS Flats Ashok Vihar Phase-IV Delhi
9. Mr. L. Neelakanta Pillai, Principal Kola Peru mal Chetty Vaishnav Sr. Sec. School 815, EVR Periyar High Road, Arumbakkam Chennai, Tamil Nadu	3. Prof. R.D. Shukla, 40, Delux Apptt. B-5, Vasundhara Enclave Delhi
10. Ms. Kanta Manchanda H. No. 577, Sector-11 B Chandigarh	4. Dr. (Mrs) Sangeeta Bhatia Principal New State Academy Sr Sec School Pitampura Near Club, Delhi
11. Sh. Surjan Singh KG-II/136, Vikasपुरी New Delhi	5. Sh.B.N.Mehrota A-32 Nanda Road, Adarsh Nagar, Delhi
12. Sh. P.N. Seth 65/42, New Rohtak Road New Delhi	6. Sh. R.C. Gond, Principal Kendriya Vidyalaya No. 2 Itanagar (Arunachal Pradesh)
	7. Sh. J. Biswas Principal Maheshwari Public School Vaishali Nagar, Ajmer (Rajasthan)

---

***S.No. Name of the Coordinator/Subject Experts***

---

8. Mrs. Lalitha Chandra Sekhran  
Principal  
DAV Girls Sr. Sec. School  
182, Lloyds Road,  
Gopalapuram Chennai, (T. N.)
9. Sh. Avinash Kumar Vohra  
PGT  
Govt. Model Sr. Sec. School  
Sector-23, Chandigarh
10. Dr. D.R. Singh  
Principal  
DA V Jawahar Vidya Mandir  
H.S.L Colony, Shyamli  
P.O. Doranda  
Ranchi, Jharkhand
11. Sh. Rakesh Dhawan  
PGT  
St. Margaret Public School  
D-Block, Prashant Vihar  
Delhi

**BIOLOGY**

1. Mrs. Rachna Gupta,  
Delhi Public School  
Vasant Kunj, New Delhi
2. Mrs. Rita Talwar  
Retd. Principal  
54, Khan Market  
New Delhi
3. Smt. Neeta Rastogi  
Principal  
Sadhu Vaswani Int. School for Girls  
2nd Street, Shanti Niketan  
New Delhi

---

***S.No. Name of the Coordinator/Subject Experts***

---

4. Mrs. Margarette Davidraj  
Principal  
Bakthavatasalam Vidyashram  
14, 31st Street, TNHB Colony  
Periyar Nagar, Korattur, Chennai,  
Tamil Nadu
5. Sh. S. K. Joshi  
Principal  
Vidya Sagar School  
Bicholi Mardana  
Indore, Madhya Pradesh
6. Sh. Virendra Srivastava  
B-3B/95 B Janakpuri  
New Delhi
7. Ms. Bandana R.P. Lazarus,  
Delhi Public School,  
Vasant Kunj,  
New Delhi
8. Sh. Y. Bhardwaj  
Principal  
Kendriya Vidyalaya  
Dehradun
9. Ms. Shivani Goswami,  
Mothers International School,  
Arobindo Marg,  
New Delhi
10. Sh. Y.P. Purang  
Retd. ADE  
C2/113, Janakpuri, New Delhi
11. Ms. S.K. Sharma  
Vice-Principal  
Govt. Model Sr. Sec. School  
Chandigarh

---

*S.No. Name of the Coordinator/Subject Experts*

---

**BIO-TECHNOLOGY**

1. Dr. K. Nirmala  
Reader  
Department of Bio-Chemistry  
Daulat Ram College  
University of Delhi  
Delhi
2. Ms. Vaishali Aggarwal  
SLS DAV Public School  
Mausam Vihar  
Delhi
3. Dr. J.S. Viridi  
Department of Microbiology  
University of Delhi  
South Campus  
Benito Juarez Road  
New Delhi
4. Mr. Sonia Varghese  
PGT  
Bio-Technology, Ramjas School  
R.K. Puram, Sector-4  
New Delhi
5. Smt. Madhumati Bhaskarwar  
PGT  
G.D. Goenka Public School  
Sector 3, Pocket - 8 & 9  
Vasant Kunj, New Delhi
6. Ms. Shikha Gupta  
J.D. Tytter School  
New Rajinder Nagar  
New Delhi

---

*S.No. Name of the Coordinator/Subject Experts*

---

7. Sh. Chaman  
Deptt. of Bio-Chem.  
Daulat Ram College  
University of Delhi  
Delhi

**INFORMATICS PRACTICE**

1. Sh. Mukesh Kumar  
PGT  
Delhi Public School  
Sec-XII, R.K. Puram,  
New Delhi
2. Sh.M.P.S. Bhatia  
NSIT, Dwarka  
B-2/7C, Lawrence Road  
New Delhi
3. Mr. K.V. Krishna Kumar  
PGT  
P.S. Sr. Sec. School  
33, Almelmangapura, Mylapore  
Chennai, Tamil Nadu
4. Mrs. Nancy Sehgal  
PGT  
Mata Jai Kaur Public School  
Ashok Vihar  
New Delhi
5. Mrs. Harjit Kaur  
PGT  
Saint Soldier Int. School  
Chandigarh
6. Sh. Gautam Sarkar  
PGT  
Modern School  
Barakhamba Road  
New Delhi

<i>S.No. Name of the Coordinator/Subject Experts</i>	<i>S.No. Name of the Coordinator/Subject Experts</i>
7. Sh. R.K. Tiwari PGT Vivekanand School D Block, Anand Vihar Delhi	5. Sh. S. Sriram HOD Mayo College Ajmer, Rajasthan
8. Dr. Richa Verma A-5, Harsh Appts. Sunder Vihar New Delhi	6. Aruna Ahuja PGT, DAV Model School Sec- 15-A, Chandigarh
9. Ms. Meera Aggerwal Amity Int. School Noida Gautam Budh Nagar, U.P.	7. Mrs. Usha Vishwanathan PGT Sri. Sankara Sr. School Chennai
<b>COMPUTER SCIENCE</b>	
1. Sh.Mukesh Kumar PGT Delhi Public School See-XII, R.K.Puram New Delhi	8. Smt. Divya Jain Apeejay School Sector-16-A, Noida Uttar Pradesh
2. Sh. M.P.S. Bhatia NSIT Dwarka Delhi B-2/7C, Lawrence Road New Delhi	9. Sh. Mohitendra Dey Delhi Public School RK Puram, Sector-12 New Delhi
<b>ENGINEERING DRAWING</b>	
3. Sh. Gautam Sarkar PGT Modern School Barakhamba Road New Delhi	1. Mr. D.P. Singh St. Andrews Scott Sr. Sec. School, I.P. Extn, Delhi
4. Sh. R.K. Tiwari PGT Vivekanand School D Block, Anand Vihar Delhi	2. Sh. Arvind Kumar Singh Chauhan Modern School Vasant Vihar New Delhi

<i>S.No. Name of the Coordinator/Subject Experts</i>	<i>S.No. Name of the Coordinator/Subject Experts</i>
3. Prof. N. L. Sachdeva Rtd. Prof. from DCE 52-D, BW Block Shalimar Bagh Delhi	6. Ms. G..M. Prema 799, LIG Flats Hastsal, Uttam Nagar New Delhi
4. Sh.R.P Chaurasiya Vice Principal (Retd.) 61/B-7, Sector-04, Rohini	7. Sh. Sushil Kaushik St. Andrews Scott Sr. Sec. School, I.P. Extn, Patparganj Delhi
5. Dr. S.M. Kapoor Retd. Principal 1/5898, Kabool Nagar Shahdara, Delhi	8. Sh. Suresh Sharma St. Andrews Scott Sr. Sec. School, I.P. Extn, Patparganj Delhi



# ENGLISH (Core)

*Time allowed : 3 hours*

*Maximum Marks : 100*

## **General Instructions:**

- (i) *This paper is divided into three Sections: A, B and C. All the sections are compulsory.*
- (ii) *Separate instructions are given with each section and question, wherever necessary. Read these instructions very carefully and follow them faithfully.*
- (iii) *Do not exceed the prescribed word limit while answering the questions.*

## **QUESTION PAPER CODE 1/1/1**

### **SECTION A : READING**

**20 Marks**

**1.** Read the passage given below and answer the questions that follow:

**12 marks**

1. Today's woman is a highly self-directed person, alive to the sense of her dignity and the importance of her functions in the private domestic domain and the public domain of the world of work. Women are rational in approach, careful in handling situations and want to do things as best as possible. The Fourth World Conference of Women held in Beijing in September 1995 had emphasised that no enduring solution of society's most threatening social, economic and political problems could be found without the participation and empowerment of the women. The 1995 World Summit for Social Development had also emphasised the pivotal role of women in eradicating poverty and mending the social fabric.
2. The Constitution of India had conferred on women equal rights and opportunities - political, social, educational and of employment - with men. Because of oppressive traditions, superstitions, exploitation and corruption, a majority of women are not allowed to enjoy the rights and opportunities, bestowed on them. One of the major reasons for this state of affairs is the lack of literacy and awareness among women. Education is the main instrument through which we can narrow down the prevailing inequality and accelerate the process of economic and political change In the status of women.
3. The role of women in a society is very important. Women's education is the key to a better life in the future. A recent World Bank study says that educating girls is not a charity, it is good economics and if developing nations are to eradicate poverty, they must educate the girls. The report says that the economic

and social returns on investment in education of the girls considerably affect the human development index of the nation. Society would progress only if the status of women is respected and the presence of an educated woman in the family would ensure education of the family itself. Education and empowerment of women are closely related.

4. Women's education has not received due care and attention from the planners and policy makers. The National Commission for Women has rightly pointed out that even after 50 years of independence, women continue to be treated as the single largest group of backward citizens of India. The role of women in overall development has not been fully understood nor has it been given its full weight in the struggle to eliminate poverty, hunger, injustice and inequality at the national level. Even when we are at the threshold of the 21st century, our society still discriminates against women in matters of their rights and privileges and prevents them from participating in the process of national and societal progress. Various Committees and Commissions have been constituted before and after the independence to evaluate the progress in women's education and to suggest ways and means to enhance the status of women. The female literacy rate has gone up in the 20th century from 0.6 percent in 1901 to 39.29 percent in 1991 but India still possesses the largest number of illiterate women in the world. The female literacy index for the year 1991 shows that there are eight States which fall below the national average. The most populous States of the country, UP, MP, Bihar and Rajasthan fall in the category of most backward States as far as female literacy is concerned.
5. The prevailing cultural norms of gender behaviour and the perceived domestic and reproductive roles of women tend to affect the education of the girls. Negative attitude towards sending girls to schools, restrictions on their mobility, early marriage, poverty and illiteracy of parents affect the girl's participation in education.
6. Women's political empowerment got a big boost with the Panchayati Raj Act of 1993 which gave them 30 percent reservation in Village Panchayats, Block Samities and Zila Parishads throughout the country. The National Commission for Women was also set up in 1992 to act as a lobby for women's issues.
7. The educational system is the only institution which can counteract the deep foundations of inequality of sexes that are built in the minds of people through the socialization process. Education is the most important instrument of human resource development. Educational system should be used to revolutionise the traditional attitudes and inculcate new values of equality.
  - (a) (i) Mention any two attributes of a modern woman. 2
  - (ii) Why are women's participation and empowerment considered necessary? 2

- |  |                  |
|--|------------------|
| (iii) Which factors adversely affect the education of girls?                                     | 2                |
| (iv) What benefits did the women get with the enactment of the Panchayati Raj Act of 1993 ?      | 2                |
| (v) By what process can we remove the sense of inequality of sexes from the minds of the people? | 1                |
| (b) Pick out words from the passage which mean the same as each of the following:                | <b>1 × 3 = 3</b> |
| (i) cruel and unfair (para 2)  |                  |
| (ii) remove (para 3)   |                  |
| (iii) full of people (para 4)  |                  |

2. Read the passage given below and answer the questions that follow: **8 marks**

Despite all the research, everyone of us catches cold and most of us catch it frequently. Our failure to control one of the commonest of all ailments sometimes seems ridiculous. Medical science regularly practises transplant surgery and has rid whole countries of such killing diseases as Typhus and the Plague. But the problem of common cold is unusually difficult and much has yet to be done to solve it.

It is known that a cold is caused by one of a number of viral infections that affect the lining of the nose and other passages leading to the lungs but the confusing variety of viruses makes study and remedy very difficult. It was shown in 1960 that many typical colds in adults are caused by one or the other of a family of viruses known as rhinoviruses, yet there still remain many colds for which no virus has as yet been isolated.

There is also the difficulty that because they are so much smaller than the bacteria which cause many other infections, viruses cannot be seen with ordinary microscopes. Nor can they be cultivated easily in the bacteriologist's laboratory, since they only grow within the living cells of animals or plants. An important recent step forward, however, is the development of the technique of tissue culture, in which bits of animal tissue are enabled to go on living and to multiply independently of the body. This has greatly aided virus research and has led to the discovery of a large number of viruses. Their existence had previously been not only unknown but even unsuspected.

The fact that we can catch cold repeatedly creates another difficulty. Usually a virus strikes only once and leaves the victim immune to further attacks. Still we do not gain immunity from colds. Why? It may possibly be due to the fact that while other viruses get into the blood stream where anti-bodies can oppose them, the viruses causing cold attack cells only on the surface. Or it may be that immunity from one of the many different viruses does not guarantee protection from all the others. It seems, therefore, that we are likely to have to suffer colds for some time yet.

- (a) On the basis of your reading of the above passage make notes on it in points only, using abbreviations wherever necessary. Also suggest a suitable title. **5**
- (b) Write a summary of the passage in not more than **80** words using the notes made. **3**

**SECTION - B (Advanced Writing Skills)**

**35 Marks**

- 3.** You are General Manager of Ivy Software Solutions, Agra Cantt, Agra. You need a software engineer for your organisation. Draft an advertisement in not more than **50** words to be published in 'The Times of India' under the classified columns. **5 marks**

**OR**

As Sports Secretary of G.D.G. Public School, Pune, draft a notice in not more than **50** words for your school notice board informing the students about the sale of old sports goods of your school. You are Rohini/Rohit.

- 4.** You are Sweety/Suresh of L.M. Jain School, Ajmer. As Secretary of your School Cocurricular Activities Club, you visited a slum area in your city where the people suffered a great loss of life and property in a massive fire. The students of your school rendered their services and material help to the victims. Write a report in **100-125** words for your school magazine. **10 marks**

**OR**

Recently your school held a Seminar on Conservation of Water as a part of World Water Day celebrations. As the School Pupil Leader of Maryland School, Gurgaon, write a report in **100-125** words for a local daily. Sign as Pritham/Preeti.

- 5.** You are Sruthi/Shiraj staying at R.K. Puram, Secunderabad. Your locality being away from the main city, the poor bus service adversely affects the life of residents. Write a letter to the Editor, Deccan Chronicle, highlighting the problems faced and also giving a few possible solutions. **10 marks**

**OR**

You are Varsha/Varun, Incharge of Excursion Club of B. V.P. School, Mathura Road, Delhi. Write a letter to the General Manager, Northern Railways, requesting reservation of a bogie for 80 students from New Delhi to Chennai and back by G.T. Express.

- 6.** Presently the prices of essential commodities are skyrocketing causing much hardship to the common man. Write an article in **150-200** words expressing your views and suggesting measures to curb this problem. **10 marks**

**OR**

The number of women in the police force seems insufficient specially when we see the increasing involvement of women in terrorist activities. Write an article in **150-200** words for 'The Hindustan Chronicle', on the need of having more women in the police force.

**SECTION - C (Text Books)**

**45 Marks**

7. Read the extract given below and answer the questions that follow:

**4 marks**

It would be an exotic moment  
without rush, without engines,  
we would all be together  
in a sudden strangeness.

- (a) What does 'it' refer to? **1**  
(b) Who is the poet speaking to? **1**  
(c) What would be the moment like? **2**

**OR**

Aunt Jennifer's tigers prance across a screen,  
Bright topaz denizens of a world of green.  
They do not fear the men beneath the tree;  
They pace in sleek chivalric certainty.

- (a) How are aunt Jennifer's tigers described? **1**  
(b) Why are they described as denizens of a world of green? **2**  
(c) Why are they not afraid of the men? **1**

8. Answer any **three** of the following in **30-40** words each:

**2 x 3 = 6 marks**

- (a) Why are the young trees described as 'sprinting'? (My Mother at Sixty-six)  
(b) How does the poet describe the class-room walls? (An Elementary School Class-room in a Slum)  
(c) What image does Keats use to describe the beautiful bounty of the earth?  
(d) What is the 'childish longing' that the poet refers to? Why is it 'vain'? (A Roadside Stand)

9. Answer the following in **30-40** words each:

**2 x 5 = 10 marks**

- (a) What had the narrator counted on to enter the school unnoticed?

- (b) When Douglas realised that he was sinking, how did he plan to save himself?
- (c) Why did the servants think Gandhiji to be another peasant?
- (d) What drawbacks of interviews have been pointed out by Lewis Carrol?
- (e) “Damn that Geoff, this was a Geoff thing not a Jansie thing.” Why did Sophie say so ?

10. Answer the following in **125-150** words:

The bangle-makers of Ferozabad make beautiful bangles and make everyone happy but they live and die in squalor. Elaborate.

**10 marks**

**OR**

The story, ‘The Rat Trap’ focuses on human loneliness and the need to bond with others. Explain.

11. Answer the following in **125-150** words:

**7 marks**

When did the Tiger King stand in danger of losing his kingdom? How was he able to avert the danger?

**OR**

How did the question paper and the correction slip help the prisoner and the Governor?

12. Answer the following in **30-40** words each:

**2 x 4 = 8 marks**

- (a) How did Charley often get lost on the Grand Central Station?
- (b) How did the Antarctica amaze the writer when he first saw it ?
- (c) Why did Jo think Roger Skunk was better off with the new smell ?
- (d) Why did the landlord’s man ask Bama’s brother, on which street he lived? What was the significance?

**QUESTION PAPER CODE 1/1**

**SECTION A : READING**

**20 Marks**

1. Read the passage given below and answer the questions that follow:

**12 marks**

1 Today’s woman is a highly self-directed person, alive to the sense of her dignity and the importance of her functions in the private domestic domain and the public domain of the world of work. Women are rational in approach, careful in handling situations and want to do, things as best as possible. The Fourth World Conference of Women held in Beijing in September 1995 had

emphasised that no enduring solution of society's most threatening social, economic and political problems could be found without the participation and empowerment of the women. The 1995 World Summit for Social Development had also emphasised the pivotal role of women in eradicating poverty and mending the social fabric.

- 2 The Constitution of India had conferred on women equal rights and opportunities - political, social, educational and of employment - with men. Because of oppressive traditions, superstitions, exploitation and corruption, a majority of women are not allowed to enjoy the rights and opportunities, bestowed on them. One of the major reasons for this state of affairs is the lack of literacy and awareness among women. Education is the main instrument through which we can narrow down the prevailing inequality and accelerate the process of economic and political change in the status of women.
- 3 The role of women in a society is very important. Women's education is the key to a better life in the future. A recent World Bank study says that educating girls is not a charity, it is good economics and if developing nations are, to eradicate poverty, they must educate the girls. The report says that the economic and social returns on investments in education of the girls considerably affect the Human Development Index of the nation. Society would progress only if the status of women is respected and the presence of an educated woman in the family would ensure education of the family itself. Education and empowerment of women are closely related.
- 4 Women's education has not received due care and attention' from the planners and policy makers. The National Commission for Women has rightly pointed out that even after 50 years of independence, women continue to be treated as the single-largest group of backward citizens of India. The role of women in overall development has not been fully understood nor has it been given its full weight in the struggle to eliminate poverty, hunger, injustice and inequality at the national level. Even when we are at the threshold of the 21st century, our society still discriminates against women in matters of their rights and privileges and prevents, them from participating in the process of national and societal progress. Various committees and commissions have been constituted before and after Independence to evaluate the progress in women's education and to suggest ways and means to enhance the status of women. The female literacy rate has gone up in the 20th century from 0.6 percent in 1901 to 39.29 percent in 1991 but India still possesses the largest number of illiterate women in the world. The Female Literacy Index for the year 1991 shows that there are eight states which fall below the national average. The most populous states of the country, UP, MP, Bihar and Rajasthan fall in the category of most backward states as far as female literacy is concerned.

- 5 The prevailing cultural norms of gender behaviour and the perceived domestic and reproductive roles of women tend to affect the education of the girls. Negative attitude towards sending girls to schools, restrictions on their mobility, early marriage, poverty and illiteracy of parents affect the girls' participation in education.
- 6 Women's political empowerment got a big boost with the Panchayati Raj Act of 1993 which gave them 30 percent reservation in Village panchayats, Block samities and Zila parishads throughout the country. The National Commission for Women was also set up in 1992 to act as a lobby for women's issues.
- 7 The educational system is the only institution which can counteract the deep foundations of inequality of sexes that are built in the minds of people through the socialization process. Education is the most important instrument of human resource development. Educational system should be used to revolutionise the traditional attitudes and inculcate new values of equality.
- (a) (i) Mention any two attributes of a modern woman. **2**
- (ii) Why is women's participation and empowerment considered necessary? **2**
- (iii) Which factors adversely affect the education of girls? **2**
- (iv) What benefits did the women get with the enactment of the Panchayati Raj Act of 1993 ? **2**
- (v) By what process can we remove the sense of inequality of sexes from the minds of the people? **1**
- (b) Pick out words from the passage which mean the same as each of the following: **1x3 = 3 marks**
- (i) cruel and unfair (para 2)
- (ii) remove (para 3)
- (iii) full of people (para 4)

2. Read the passage given below and answer the questions that follow: **8 marks**

Despite all the research, everyone of us catches cold and most of us catch it frequently. Our failure to control one of the commonest of all ailments sometimes seems ridiculous. Medical science regularly practices transplant surgery and has rid whole countries of such killing diseases as Typhus and the Plague. But the problem of common cold is unusually difficult and much has yet to be done to solve it.

It is known that a cold is caused by one of a number of viral infections that affect the lining of the nose and other passages leading to the lungs but the confusing variety of



viruses makes study and remedy very difficult. It was shown in 1960 that many typical colds in adults are caused by one or the other of a family of viruses known as rhinoviruses, yet there still remain many colds for which no virus has as yet been isolated.

There is also the difficulty that because they are, so much smaller than the bacteria which cause many other infections, viruses cannot be seen with ordinary microscopes. Nor can they be cultivated easily in the bacteriologist's laboratory, since they only grow within the living cells of animals or plants. An important recent step forward, however, is the development of the technique of tissue culture, in which bits of animal tissue are enabled to go on living and to multiply independently of the body. This has greatly aided virus research and has led to the discovery of a large number of viruses. Their existence had previously been not only unknown but even unsuspected.

The fact that we can catch cold repeatedly creates another difficulty. Usually a virus strikes only once and leaves the victim immune to further attacks. Still, we do not gain immunity from colds. Why? It may possibly be due to the fact that while other viruses get into the bloodstream where antibodies can oppose them - the viruses causing cold attack cells only on the surface. Or it may be that immunity from one of the many different viruses does not guarantee protection from all others. It seems, therefore, that we are likely to have to suffer colds for some time yet.

- (a) On the basis of your reading of the above passage make notes on it in points only, using abbreviations wherever necessary. Also suggest a suitable title. **5**
- (b) Write a summary of the passage in not more than 80 words using the notes made. **3**

### **SECTION B : ADVANCED WRITING SKILLS**

**35 Marks**

3. You are the Secretary of your school Literary Association. Write a notice in not more than 50 words for your school notice board, giving details of the proposed inauguration of the Literary Association of your school. You are 'XYZ' of Jain Vidyashram, Cuddalore. **5 marks**

**OR**

You are the General Manager of E.V.L. Company which requires posh bungalows on company lease, as guest houses. Draft an advertisement in not more than 50 words under classified columns to be published in 'The New Indian Express'.

4. Your school organised an exhibition-cum-sale of the items prepared under Work Experience by your school students. There was an overwhelming response from the public. Prepare a report in 100 - 125 words for a local daily. You are the Coordinator, S.U.P.W. activities, Nita School, Gurgaon. **10 marks**

**OR**

Your school organised a seminar on Swine Flu for creating awareness among students of your school, and their parents. As Secretary of the Health Club of Oasis Public School, Hyderabad, write a report in 100 - 125 words for 'The Deccan Herald'.

5. Write a letter to the Editor, 'The Hindu', Chennai about rash and reckless driving by the people in your city, suggesting preventive measures. You are Kamal / Kanwar of 10, Mount Road, Velacherry.

**10 marks**

**OR**

You have shifted your residence from 10, Lajpat Road to House No. 232, Aurobindo Marg, Delhi. Write a letter to the General Manager, MTNL requesting him for an early transfer of your telephone line. You are Rohit/Radhika of 15, The Mall, Amritsar.

6. As compared to the older generation the youth of today are greatly inclined to pursue adventurous activities either for money or for fun. There is a latest craze for joining reality shows, rafting, rock climbing, mountaineering etc. Write an article in 150 - 200 words on 'which life you would prefer - safe or adventurous'.

**10 marks**

**OR**

Science attempts to explore the secrets of nature while religion wants to reveal the very purpose of existence. The aim of both science and religion is to discover the truth. Write an article in 150 - 200 words on 'Science and Religion'.

### **SECTION C : TEXT BOOKS**

**45 Marks**

7. Read the extract given below and answer the questions that follow:

**4 marks**

... On their slag heap, these children  
Wear skins peeped through by bones and spectacles of steel  
With mended glass, like bottle bits on stones.  
All of their time and space are foggy slum.  
So blot their maps with slums as big as doom.

- (a) Which two images are used to describe these slums? **2**
- (b) What sort of life do these children lead? **1**
- (c) Which figure of speech is used in the last line? **1**

**OR**

Or beauty rest in a beautiful mountain scene,  
You have the money, but if you want to be mean,  
Why keep your money (this crossly) and go along.  
The hurt to the scenery wouldn't be my complaint  
So much as the trusting sorrow of what is unsaid:

- (a) What attraction does the place offer? 1
- (b) What should one do if one wants to be mean? 1
- (c) What does the poet not complain about? 1
- (d) What do you think is the real worry of the poet? 1
- 8.** Answer any **three** of the following in 30 - 40 words each: **2 x 3 = 6 marks**
- (a) What is the significance of the parting words of the poet and her smile, in 'My Mother at Sixty-six' ?
- (b) According to the poet, what is it that human beings can learn from Nature? (Keeping Quiet)
- (c) What makes human beings love life in spite of troubles and sufferings? (A Thing of Beauty)
- (d) What will happen to Aunt Jennifer's tigers when she is dead?
- 9.** Answer the following in 30 - 40 words each: **2 x 5 = 10 marks**
- (a) What changes came over little Franz after he heard M. Hamel's announcement? (The Last Lesson)
- (b) Why does the author say that the bangle makers are caught in a vicious web? (Lost Spring)
- (c) Why was Edla happy to see the gift left by the peddler?  
(The Rattrap)
- (d) How did the people of Madras and those at the Gemini Studios respond to the plays staged by the Moral Re-Armament army?
- (e) Why did Sophie like her brother Geoff more than any other person?
- 10.** Answer the following in 125 - 150 words: **10 marks**
- "... there was terror in my heart at the overpowering force of the waves." When did Douglas start fearing water? Which experience had further strengthened its hold on his mind and personality?
- OR**
- What impression do you form about Umberto Eco as a scholar and writer on the basis of 'The Interview' ?
- 11.** Answer the following in 125 - 150 words: **7 marks**
- What are phytoplankton? How are they important to our ecosystem?

**OR**

How did Mr. Lamb try to give courage and confidence to Derry?

12. Answer the following in 30 - 40 words each:

**2 x 4 = 8 marks**

- (a) What did the British officer's secretary tell the Maharaja? Why did the Maharaja refuse permission?
- (b) Why did the messenger come to Dr. Sadao? What did Hana think about it?
- (c) Why did Evans not take off his hat when Jackson ordered him to do so?
- (d) Why was Zitkala-Sa terrified when Judewin told her that her hair would be cut short?

## Marking Scheme — English Core

### *General Instructions :*

1. Evaluation is to be done as per instructions provided in the Marking Scheme.
2. The Marking Scheme provides suggested guidelines and not the complete answers.
3. If a question has parts, marks must be awarded on the right hand side for each part. Marks awarded for different parts of the question should then be totalled up, written and circled on the left hand margin of the answers.
4. If a question does not have any parts, marks for that question must be awarded on the left-hand margin of the answer.
5. Where marks are allotted separately for content and expression as per the Marking Scheme, they have to be reflected separately and then totalled up. This is a mandatory requirement.
6. A slash (/) in the Marking Scheme indicates alternative answers to a question. If a student writes an answer which is not given in the Marking Scheme but which seems to be equally acceptable, marks must be awarded in consultation with the Head-Examiner.
7. If a child has attempted an extra-question, answer of the question deserving more marks should be retained and the other answer scored out.
8. Q1 under Section A (reading) and Q7 under Section C (text books) have been designed to test students' ability to comprehend the given passage. As such the examinees are not to be unnecessarily penalised for language errors.
9. Where questions have been designed to test the writing skills of students, the expression (grammatical accuracy, appropriate use of words, style, spelling, organization and presentation of relevant matter in a coherent and logical way) assumes as much importance as the content.
10. Identify major mistakes and weaknesses before awarding marks.
11. Wherever the word limit is given, no marks be deducted for exceeding the word limit. However, due credit should be given for precise answers.

12. If a student, in response to a short-answer-type question, writes a single word / phrase which constitutes the core of the answer. It must be accepted and awarded marks.
13. If a student literally lifts a portion of the given passage / extract from the question paper as an answer to a question, no mark(s) to be deducted as long as it is relevant and indicative of the desired understanding on the part of the student [reference questions under Q1 and Q7(a)].
14. A full scale of marks - 0 to 100 is to be used. In case of an answer book deserving 90 marks and above, marks be awarded in consultation with the Head Examiner only.

QUESTION PAPER CODE 1/1/1

**EXPECTED ANSWERS/VALUE POINTS**

**SECTION A: (READING) 20 Marks**

**1. COMPREHENSION PASSAGE**

**TOTAL MARKS: 12**

(a) NOTE: No mark(s) should be deducted for mistakes in usage and grammar, spelling, or word limit. Full marks may be awarded if a student has been able to identify the core ideas. If a student literally lifts a portion of the given passage as an answer to a question, no mark(s) to be deducted for this as long as it is relevant.

- |       |   |         |
|-------|---|---------|
| (i)   | <ul style="list-style-type: none"> <li>- highly self - directed / progressive</li> <li>- alive to the sense of her dignity</li> <li>- aware about the importance of her functions in domestic and public domains</li> <li>- rational in approach</li> <li>- careful in handling situations</li> <li>- desire to do things as best as possible</li> </ul> <p style="text-align: center;">(any two)</p> | 2 marks |
| (ii)  | <ul style="list-style-type: none"> <li>- enduring solutions of society's most threatening social, economic and political problems possible only through women's participation and empowerment</li> </ul>  | 2 marks |
| (iii) | <ul style="list-style-type: none"> <li>- prevailing cultural norms of gender behaviour and perceived domestic and reproductive roles of women</li> </ul>  | 2 marks |

- negative attitude towards sending girls to schools
  - early marriage, poverty, illiteracy of parents, restrictions on their mobility
  - deep foundation of inequality of sexes
- (any two)
- (iv) - women's political empowerment got a big boost 2 marks
- 30% reservation in Village Panchayats, Block Samities and Zila Parishads throughout the country.
- (anyone)
- (v) - educational system / socialisation process 1 mark
- (b) (i) oppressive / exploitation 1 mark
- (ii) eradicate 1 mark
- (iii) populous 1 mark

## 2. Note

- **If a student has attempted only summary or only notes, due credit should be given.**
- **1 mark allotted for the title be given if a student has written the title either in Q2(a) or Q2(b) part**
- **Min. 3 main headings and 3 sub-headings to form content**

The notes provided below are only guidelines. Any other title, main points and sub-points should be accepted if they are indicative of the candidate's understanding of the given passage, and the notes include the main points, with suitable and recognizable abbreviations. Complete sentences not to be accepted as notes (In such cases ½ - 1 mark may be deducted from marks allotted to content).

Numbering of points can be indicated in different ways, and these should be accepted as long as a consistent pattern is followed.

### (a) NOTE MAKING

Distribution of Marks

**Abbreviations / Symbols** (with /without key) - any four 1 mark

**Title** 1 mark

**Content** (minimum 3 headings and sub-headings, with proper indentation and notes) 3 marks

## Suggested Notes

**Title:** Cold / Common Cold / Common Cold - A Menace / any other suitable title

- 1 The Problem of common cold / What is common cold?
  - 1.1 catching cold - common / commonest of all ailments
  - 1.2 diff. to control occurs repeatedly / caught frequently / one suffers time and again
  - 1.3 med. sc. has failed to find cure / not much done to solve it
- 2 Causes / Causes and areas affected
  - 2.1 no. of viral infections
  - 2.2 spread by family of viruses / rhinoviruses are responsible
  - 2.3 affects lining of nose
  - 2.4 affects other passages leading to lungs
  - 2.5 viruses for many colds still not isolated
- 3 Virus research / Difficulty in controlling common cold virus
  - 3.1 viruses can't be seen with ord. microscope
  - 3.2 diff. to cultivate in bacteriologist's lab / can't be cultivated in labs.
  - 3.3 can't be isolated
  - 3.4 tissue culture has led to discovery of many viruses
  - 3.5 attacks surface cells:.. dif. to oppose
  - 3.6 immunity from one does not guarantee against others
- 4 Techniques of tissue culture
  - 4.1 a recent step
  - 4.2 has aided virus research
  - 4.3 bits of animal tissues enabled to live indep' nt'ly of the body
  - 4.4 led to discovery of unknown / unsuspected viruses
- 5 Immunity to cold
  - 5.1 no immunity
  - 5.2 viruses attack cells on the surface
  - 5.3 many types of viruses – hence no protection



(b) **Summary**

The summary should include all the important points given in the notes.

**Content**

2 marks

**Expression**

1 mark

**SECTION B: ADVANCED WRITING SKILLS**

**NOTE:** The objective of the section on Advanced Writing Skills is to test a candidate's writing ability. Hence, expression assumes as much importance as the content of the answer.

**3. ADVERTISEMENT**

**Content**

3 marks

**Expression**

2 marks

**Suggested value points**

(SITUATION VACANT - SOFTWARE ENGINEER)

- advertiser
  - post advertised
  - qualifications (essential / desirable), work experience
  - age, salary, last date for applying (mode of applying)
  - address, tel. nos., email – address
- (due credit should be given for economy of words used)

**OR**

**NOTICE**

**Format**

1 mark

The format should include: NOTICE / TITLE, DATE, and WRITER'S NAME WITH DESIGNATION The candidate should not be penalized if he has used capital letters for writing a notice within or without a box.

**Content**

2 marks

**Expression**

2 marks

**Suggested value points**

(SALE OF OLD SPORTS GOODS)

- day, date, time, venue of sale
- sports items for sale (category)
- condition of the items, etc
- whom to contact

#### 4. REPORT WRITING

##### Format

1. title, reporter's name 1 mark

##### Content

4 marks

##### Expression

5 marks

grammatical accuracy, appropriate words and spelling [2 ½]

coherence and relevance of ideas and style [2 ½]

##### Suggested value points:

(LOSS OF LIFE AND PROPERTY IN MASSIVE FIRE / any other suitable heading)

- what, when, where, how, why (whichever applicable)
- the tragedy.
- help rendered by students
- any other relevant details

#### OR

##### Suggested value points

(SEMINAR ON CONSERVATION OF WATER)

- what, when, where, how / why (whichever applicable)
- participants
- issues discussed
- action plan prepared / resolutions adopted
- highlights of the programme
- any other relevant details

#### 5. LETTER WRITING

[Note: - No marks are to be awarded if only the format is given. Credit should be given for the candidate's creativity in presentation of ideas. Use of both the traditional and the new format is permitted.]

##### Format

2 marks

1. sender's address, 2. date, 3. receiver's address. 4, subject / heading, 5. salutation, 6. complimentary close.

##### Content

4 marks

**Expression**

4 marks

grammatical accuracy, appropriate words and spelling [2]

coherence and relevance of ideas and style [2]

(POOR BUS SERVICE)

**Suggested Value Points**

Problems faced

- poor bus service - adversely affecting the lives of residents
- colony far from the main city
- long wait / few buses frequenting the area / at times don't even stop
- buses overcrowded
- boarding not safe
- school children, office goers worst affected
- money wasted on autos, taxis for commuting

Possible solutions

- improving bus service
- increasing no of buses
- repeated pleas and requests to the transport dept / corporation no relief
- any other relevant details

**OR**

(RESERVATION OF A RAILWAY BOGIE)

**Suggested Value Points**

- purpose of writing the letter / request
- train no. and name
- class (AC/ non AC), no. of berths needed / size of group
- starting point / destination
- date of onward journey / return journey
- request for student concession
- amount to be paid
- confirmation
- any other relevant details

**6. ARTICLE WRITING**

**Format:** (Title and writer's name)

1 mark

**Content**

4 marks

**Expression**

5 marks

grammatical accuracy, appropriate words and spelling

[2½]

coherence and relevance of ideas and style

[2½]

**Suggested Value Points**

(PRICE RISE OF ESSENTIAL COMMODITIES / any other suitable title)

- the problem of price rise / alarming rise in prices of essential commodities
- causes and effect
- hardships faced by common man
- poor people worst affected
- family budgets badly affected
- any other relevant details

measures to curb the problem

- improving the production / importing essential commodities
- improving the Public Distribution System (PDS) / fair price shops, Kendriya Bhandars, Safal outlets, etc
- checking hoarding and black marketing
- any other relevant details

**OR**

**Suggested Value Points**

(MORE WOMEN IN POLICE FORCE / WOMEN AND POLICE FORCE / any other suitable title)

the problem – fewer women in police force

the need - more women needed to join the police force

- screening of women terrorists becomes easier
- more sensitive to the needs of the public
- to keep them away from the influence of anti-social groups
- to provide decent employment

the solution

- more encouragement, better salary and better incentives
- easy process of recruitment
- empowerment through recruitment
- creating awareness through campaigns
- conducive environment in police forces
- any other relevant details

### **SECTION C: LITERATURE (TEXT BOOKS)**

- 7.** [This question has been designed to test the students' understanding of the text and their ability to interpret, evaluate and respond to the questions based on the given extract. In other words, it attempts to test their reading comprehension ONLY.]

**Value points:**

- (a) - keeping still / keeping quiet 1 mark  
- not speaking in any language  
- not moving our arms so much  
- taking a break from all senseless activities  
- without rush / without engines  
- stillness / togetherness

(anyone)

- (b) - to everybody (humanity) 1 mark  
- to us / to the readers  
- to those engaged in destructive activities

(anyone)

- (c) - exotic / without rush / without engines / togetherness / sudden strangeness / stillness / promoting harmony and brotherhood 2 marks

(any two)

**OR**

- (a) - bright topaz denizens of a world of green 1 mark  
- pacing in chivalric certainty  
- fearless  
- prancing across a screen

(anyone)

- (b) - found mostly in forests; woods / green cover 2 marks  
(anyone)
- (c) - fearless by nature / wild / ferocious / not real tigers (embroidered on the panel) / alternate reality 1 mark  
(anyone)

### 8. Short answer type questions (Poetry)

Distribution of marks:

**Content:** 1 mark

**Expression** 1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

**Value points:**

- (a) - trees seen from a moving car (theory of relativity) 2 marks  
- trees young, mother old  
- contrast shown between young trees and old mother (figurative meaning also accepted)  
(anyone)
- (b) - sour cream walls / bleak / depressing / gloomy / pictures of Shakespeare, ships / sun / cities / scenery / flowers / Tyrolean valley 2 marks  
(any two)
- (c) - bower / flowery band / the sun / the moon / trees old and young / shady boon / daffodils / green world / clear rills / cooling covert / mid forest brake / fair musk rose / visual images / audio images / images of sense and smell 2 marks  
(any two)
- (d) - waiting for cars to stop to buy their wares (to earn money) 2 marks  
- few cars stop / few buyers / endless wait.

### 9. Short answer type questions (Prose)

Questions are to be answered in 30-40 words each.

Distribution of marks:

**Content:** 1 mark

Expression 1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

**Value points:**

- (a) - commotion / noise / hustle and bustle / opening - closing of desks / lessons read out loudly / preoccupation of the teacher 2 marks  
(anyone)
- (b) - planned to make a big jump after hitting the bottom, come to surface, lie flat on it and paddle to the edge of the pool 2 marks
- (c) - was accompanied by Raj Kumar Shukla, a small farmer 2 marks  
- possibly Gandhi was dressed as a peasant / his clothes / his appearance / his simplicity  
(anyone)
- (d) - had the horror of the interviewer / never consented to be interviewed / didn't want to be lionised 2 marks  
(anyone)
- (e) - had told Geoff of her imaginary meeting with Danny Casey 2 marks  
- expected him to keep the secret  
- knew Geoff would easily believe her  
- Jansie was nosey - would spread the word around  
(any two)

Q 10 & 11 [These questions have been set to test the students' understanding of the text and their ability to interpret, evaluate and respond to the issues raised therein. Hence no particular answer can be accepted as the only correct answer. All presentations may be accepted as equally correct provided they have been duly supported by the facts drawn from the text. The important thing is that the student should be able to justify his or her viewpoint.]

**10. Distribution of marks:**

**Content** 5 marks

**Expression** 5 marks

grammatical accuracy, appropriate words and spelling [2½]

coherence and relevance of ideas and style [2½]

**Value points:**

- in spite of their hard work and skill in bangle making they remain poor as the middlemen pocket all their profit
- pathetic working conditions

- dark hutments / dingy cells / without air and light
- glass furnaces with high temperatures / losing eyesight at early age
- stinking lanes / squalor / hovels / primeval living conditions

(any five)

**OR**

life of the peddler

- poorly dressed, starving, lonely, tramp, wandered from place to place, making small rattraps with material begged from stores or big firms, begged and committed petty thievery, scared of the police

meeting with the old crofter

- the crofter's loneliness and hospitality

meeting with the Ironmaster and his daughter (Edla)

- father - ready to turn him out when his real identity was known
- daughter treated him like a guest, offered him good food, clothes and shelter / treated him like the regimental officer as initially assumed by her father
- this treatment brought about a total transformation in the peddler - resolved to pull himself up, to live a life of respect and dignity

(any five)

**11. Distribution of marks:**

**Content:**

4 marks

**Expression**

3 marks

grammatical accuracy, appropriate words and spelling

[1½]

coherence and relevance of ideas and style

[1½]

**Value Points:**

- a high ranking British officer visited Pratibandapuram-wanted to shoot tigers and be photographed with them. Maharaja refused him permission to shoot tigers as he himself had resolved to shoot 100 tigers to prove the priest's predictions wrong and to ensure his own longevity
- to appease the British officer, he sent 50 diamond rings specially designed by famous British company of jewellers in Calcutta, to the British officer's good lady. He expected them to keep one or two rings and send the rest back, they kept all the rings, he had to pay rupees three lakh but saved his kingdom



**OR**

- helped Evans to know the name of the hotel and its location. also came to know about the exact time when the exam would start
- helped Governor to put 313/217 together and with the six figure reference knew that Evans had escaped to Chipping Norton
- the Governor could work out a plan to arrest Evans

**12. Distribution of marks:**

**Content:** 1 mark

**Expression** 1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

**Value points:**

(a) - maze of new doorways, stairs and corridors, long tunnels, very confusing entry and exit points 2 marks

(anyone)

(b) - impressed with Antarctica's expansive white landscape and uninterrupted blue horizon. 2 marks

- felt relieved after a long tiring journey, then experienced profound wonder at its immensity, its isolation

- wondered at the thought that India and Antarctica were once part of the same landmass

(any two)

(c) - earlier he was lonely / had no friends because of his foul smell 2 marks

- had many friends when he started smelling like roses

- could play games with them

(any two)

(d) - couldn't make out Bama's brother's caste from his name so asked him on which street he lived to know his caste 2 marks

- people of the same caste lived together in the same street or locality

- caste discrimination was being practised

(any two)

QUESTION PAPER CODE 1/1

**EXPECTED ANSWERS/VALUE POINTS**

**SECTION A: (READING) 20 Marks**

**1. COMPREHENSION PASSAGE**

**TOTAL MARKS: 12**

(a) NOTE: No mark(s) should be deducted for mistakes in usage and grammar, spelling, or word limit. Full marks may be awarded if a student has been able to identify the core ideas. If a student literally lifts a portion of the given passage as an answer to a question, no mark(s) to be deducted for this as long as it is relevant.

- (i) - highly self - directed / progressive 2 marks  
- alive to the sense of her dignity  
- aware about the importance of her functions in domestic and public domains  
- rational in approach  
- careful in handling situations  
- desire to do things as best as possible  
(any two)
- (ii) - enduring solutions of society's most threatening social, economic and political problems possible only through women's participation and empowerment 2 marks
- (iii) - prevailing cultural norms of gender behaviour and perceived domestic and reproductive roles of women 2 marks  
- negative attitude towards sending girls to schools  
- early marriage, poverty, illiteracy of parents, restrictions on their mobility  
- deep foundation of inequality of sexes  
(any two)
- (iv) - women's political empowerment got a big boost 2 marks  
- 30% reservation in Village Panchayats, Block Samities and Zila Parishads throughout the country.  
(anyone)
- (v) - educational system / socialisation process 1 mark

- |     |       |                           |        |
|-----|-------|---------------------------|--------|
| (b) | (i)   | oppressive / exploitation | 1 mark |
|     | (ii)  | eradicate                 | 1 mark |
|     | (iii) | populous                  | 1 mark |

## 2. Note

- **If a student has attempted only summary or only notes, due credit should be given.**
- **1 mark allotted for the title be given if a student has written the title either in Q2(a) or Q2(b) part**
- **Min. 3 main headings and 3 sub-headings to form content**

The notes provided below are only guidelines. Any other title, main points and sub-points should be accepted if they are indicative of the candidate's understanding of the given passage, and the notes include the main points, with suitable and recognizable abbreviations. Complete sentences not to be accepted as notes (in such cases ½ -1 mark may be deducted from marks allotted to content)

Numbering of points can be indicated in different ways, and these should be accepted as long as a consistent pattern is followed.

### (a) NOTE MAKING

Distribution of Marks

**Abbreviations / Symbols** (with /without key) - any four 1 mark

**Title** 1 mark

**Content** (minimum 3 headings and sub-headings, with proper indentation and notes) 3 marks

#### **Suggested Notes**

**Title:** Cold / Common Cold / Common Cold - A Menace / any other suitable title

- 1 The Problem of common cold / What is common cold ?
  - 1.1 catching cold - common / commonest of all ailments
  - 1.2 diff. to control occurs repeatedly / caught frequently / one suffers time and again
  - 1.3 med. sc. has failed to find cure / not much done to solve it
- 2 Causes / Causes and areas affected
  - 2.1 no. of viral infect'ns
  - 2.2 spread by family of viruses / rhinoviruses are responsible

- 2.3 affects lining of nose
- 2.4 affects other passages leading to lungs
- 2.5 viruses for many colds still not isolated
- 3 Virus research/ Difficulty in controlling common cold virus
  - 3.1 viruses can't be seen with ord. microsc'pe
  - 3.2 diff. to cultivate in bacteriologist's lab / can't be cultivated in labs.
  - 3.3 can't be isolated
  - 3.4 tissue culture has led to discovery of many viruses
  - 3.5 attacks surface cells:. dif. to oppose
  - 3.6 immunity from one does not guarantee against others
- 4 Techniques of tissue culture
  - 4.1 a recent step
  - 4.2 has aided virus research
  - 4.3 bits of animal tissues enabled to live indep' nt'ly of the body
  - 4.4 led to discovery of unknown / unsuspected viruses
- 5 Immunity to cold
  - 5.1 no immunity
  - 5.2 viruses attack cells on the surface
  - 5.3 many types of viruses – hence no protect'n

(b) **Summary**

The summary should include all the important points given in the notes.

**Content**

2 marks

**Expression**

1 mark

**SECTION B: ADVANCED WRITING SKILLS**

**NOTE:** The objective of the section on Advanced Writing Skills is to test a candidate's writing ability. Hence, expression assumes as much importance as the content of the answer.

**3. NOTICE**

**Format**

1 mark

The format should include: NOTICE / TITLE, DATE, and WRITER'S NAME WITH DESIGNATION. The candidate should not be penalized if he has used capital letters for writing a notice within or without a box.

**Content** 2 marks

**Expression** 2 marks

**Suggested value points**

(INAUGURATION OF LITERARY ASSOCIATION)

- what (inauguration of literary association)
- where (venue)
- when (date and time)
- chief guest and target audience
- any other relevant details

**OR**

**ADVERTISEMENT**

**Content** 3 marks

**Expression** 2 marks

**Suggested value points**

(BUNGALOWS REQUIRED / WANTED ON COMPANY LEASE)

- type of accommodation
- location
- purpose (guest house)
- expected rent
- facilities
- contact

(Due credit should be given for economy of words used)

**4. REPORT WRITING**

**Format**

1. title, reporter's name 1 mark

**Content** 4 marks

**Expression** 5 marks

grammatical accuracy, appropriate words and spelling [2 ½]

coherence and relevance of ideas and style [2 ½]

**Suggested value points:**

(EXHIBITION CUM SALE/ any other suitable heading)

- what (exhibition cum sale)
- when (date and time)
- where (venue)
- duration
- inauguration
- highlights (various stalls, items displayed, student participants)
- response of public and success of programme
- any other relevant points

**OR**

**Suggested value points**

(SEMINAR ON SWINE FLU)

- what, when, where, how / why
- various sessions
- guest speakers, panel of experts
- highlights (activities undertaken, aids used)
- target audience (students and parents)
- response and outcome
- any other relevant details

**5. LEITER WRITING**

[Note: - No marks are to be awarded if only the format is given. Credit should be given for the candidate's creativity in presentation of ideas. Use of both the traditional and the new format is permitted.]

**Format**

2 marks

1. sender's address, 2. date, 3. receiver's address. 4, subject / heading, 5. salutation, 6. complimentary close.

**Content**

4 marks

**Expression**

4 marks

grammatical accuracy, appropriate words and spelling [2]

coherence and relevance of ideas and style [2]

(RASH AND RECKLESS DRIVING)

**Suggested Value Points**

rash and reckless driving

- chaos on roads
- danger to road users
- hit and run cases
- accidents - deaths, injuries
- road rage

possible suggestions for prevention

- better policing
- strict norms for issue of license
- strict traffic rules and their implementation
- enforcing speed limits within the city
- imposing fines
- spreading awareness and education
- any other relevant details

**OR**

(TRANSFER OF TELEPHONE LINE)

**Suggested Value Points**

- shifting of residence from present address to new address, request for early transfer of telephone
- telephone number
- new address
- any other relevant details

**6. ARTICLE WRITING**

**Format:** (Title and writer's name)

1 mark

**Content**

4 marks

**Expression**

5 marks

grammatical accuracy, appropriate words and spelling

[2½]

coherence and relevance of ideas and style

[2½]

### **Suggested Value Points**

(SAFE OR ADVENTUROUS LIFE / LIFE AND ADVENTURE / any other suitable title)

safe life

- life meant to be lived not risked
- life is precious
- to avoid disappointment and failure / frustration
- prioritizing
- adventure waste of time and money
- moral duty / responsibility to live life safe for the loved ones
- avoid distraction
- any other relevant point

(any 4)

adventure

- life to be lived to the fullest
- thrilling/exciting
- raises quality of life
- craving for exploration and adventure
- for name and fame
- romancing danger
- obsession with risk
- any other relevant point

(any 4)

[Note: If the student writes in first person he/she should not be penalized because it is an open ended question.]

**OR**

### **Suggested Value Points**

(SCIENCE AND RELIGION / any other suitable title)

- both complementary / both support life and go hand in hand

Science

- rational
- scientific
- explores the physical world
- involves experimentation and observation (any two)



Religion

- discovers spirituality
- inner truth
- strengthens moral, cultural and universal values (any two)
- any other relevant point

**SECTION C: LITERATURE (TEXT BOOKS)**

7. [This question has been designed to test the students' understanding of the text and their ability to interpret, evaluate and respond to the questions based on the given extract. In other words, it attempts to test their reading comprehension ONLY.]

**Value points:**

- (a) - slag heap 2 marks  
- foggy slums  
- slums as big as doom

(any two)

- (b) - dirty / unhygienic / miserable / pathetic / full of woes and wants /  
uncertain future / blotted / life of disease and despair / impoverished /  
poor / bones peeping through skins / spectacles of mended glass / their  
time and space are foggy 1 mark

(anyone)

- (c) - simile 1 mark

**OR**

- (a) - beautiful mountain scene / landscape / scenery 1 mark

(anyone)

- (b) - keep ones' money and move ahead / not sharing / being indifferent /  
insensitive / don't stop by / don't buy their products 1 mark

(anyone)

- (c) - hurt the scenery / spoil the scenery / marring the landscape / harm the  
scenery / the existence of roadside stand 1 mark

(anyone)

- (d) immensely pained at 1 mark

- lack of concern of the city people / betrayed trust of the farmers /  
unexpressed sorrow of the farmers / unfulfilled promise of the 'politicians  
/ the gullibility of the farmers

(any one)

**8. Short answer type questions (Poetry)**

Questions are to be answered in 30-40 words.

Distribution of marks:

**Content:** 1 mark

**Expression** 1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

**Value points:**

(a) - optimism 2 marks

- a hope to see her mother again
- reassuring her mother
- hiding her anxiety and fear
- emotions hidden behind the smile
- true feeling of loss and pain of separation

(any two)

(b) - stillness 2 marks

- learn to be productive and constructive
- emergence of new life uninterrupted
- reserve energy to sprout

(any two)

(c) - natural beauty / any object of beauty 2 marks

- sight of beautiful things
- nurturing liveliness
- sublimating influence of beautiful things
- eternal beauty of nature

(any two)

(d) - go on prancing / would outlive their creator / live a fearless and proud life / remain undeterred / exhibit their freedom 2 marks

(anyone)

**9. Short answer type questions (Prose)**

Questions are to be answered in 30-40 words each.

Distribution of marks:

**Content:** 1 mark

Expression 1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

**Value points:**

- (a) - initial excitement 2 marks  
- felt regretful  
- guilt ridden for having neglected his lessons and escaping school  
- realised the worth of the teacher and the language  
- suddenly books became his prized possessions  
(any two)
- (b) - victims of inhuman sahkars, middlemen, politicians, bureaucrats, policemen 2 marks  
- stigma of caste and exploitation  
- no escape from the lineage  
(any two)
- (c) - It restored her faith in the belief that all human beings are basically good / had succeeded in bringing about a transformation in the peddler / his basic goodness had been awakened / peddler had not let her down 2 marks  
(any two)
- (d) - saw the play over and over again / very impressed / welcomed and highly appreciated 2 marks  
(any two)
- (e) - felt comfortable in sharing her secrets with him 2 marks  
- He listened patiently.  
- She respected him and looked up to him  
- a link between her and the vast world outside  
- let her feel that he believed her  
(any two)

Q 10 & 11 [These questions have been set to test the students' understanding of the text and their ability to interpret, evaluate and respond to the issues raised therein. Hence no particular answer can be accepted as the only correct answer. All presentations may be accepted as equally correct provided they have been duly supported by the facts drawn from the text. The important thing is that the student should be able to justify his or her viewpoint.]

**10.** Distribution of marks:

**Content** 5 marks

**Expression** 5 marks

grammatical accuracy, appropriate words and spelling [2½]

coherence and relevance of ideas and style [2½]

- When 3 or 4 years old he was knocked down by the waves at California beach.
- childhood misadventure - near drowning experience at YMCA pool (details to be elaborated)
- fear of water thereafter remained a handicap

**OR**

- Prof at Univ. of Bologna, Italy
- likes to attend academic meetings.
- scholar in semiotics, does literary interpretation
- writes academic text, children's books, newspaper articles, novels on Sundays, written 40 papers on scholarly works of non fiction
- narrative style - informal, playful
- research work - has qualities of creative style
- 'The Name of the Rose' - brought a lot of fame and large audience

(any four)

**11.** Distribution of marks:

**Content:** 4 marks

**Expression** 3 marks

grammatical accuracy, appropriate words and spelling [1½]

coherence and relevance of ideas and style [1½]

**Value Points:**

- microscopic plants
- nourish and sustain the food chain of the southern oceans
- single celled plants - use sun's energy to assimilate carbon and synthesise organic compounds

(any two)

importance - the absence of phytoplankton will lead to

- depletion of ozone will affect phytoplankton
- will affect all the marine birds / animals
- carbon cycle will be affected
- take care of small things to take care of big things

(any two)

**OR**

- the way he welcomed the child accepting him as he was
- told him - it's important to see how you are inside than how you look outside
- one cannot go through life being scared and alienated
- not to brood over limitations but count on his blessings
- enjoy simple joys of everyday living with people around and nature, ignoring the unpleasant
- it's one's attitude that matters
- individual makes a difference to the problem
- extended unconditional love
- inspired him with love for life
- instilled confidence in him

(any four)

**12. Distribution of marks:**

**Content:**

1 mark

**Expression**

1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

**Value points:**

- (a) - the officer wanted to be photographed with the dead tiger and did not mind the actual killing be done by the Maharaja 2 marks
- feared that other British officers would turn up for tiger hunting / wanted to kill 100 tigers himself
- (b) - to inform that the General was in pain and needed Dr Sadao to visit him 2 marks
- thought servants had betrayed him / messenger had come to arrest him for sheltering an American
- (c) - to hide his cropped hair / to pass off as McLeery 2 marks
- to hide his plan of escape
- (d) - cutting hair short was an indignity 2 marks
- against her custom
- sign of mourning, cowardice and defeat
- long hair - symbol of bravery

# FUNCTIONAL ENGLISH

*Time allowed : 3 hours*

*Maximum Marks : 100*

## **General Instructions:**

- (i) *This paper is divided into four Sections: A, B, C and D. All the sections are compulsory.*
- (ii) *Separate instructions are given with each section and question, wherever necessary. Read these instructions very carefully and follow them faithfully.*
- (iii) *Do not exceed the prescribed word limit while answering the questions.*

## **QUESTION PAPER CODE 212/1**

### **SECTION A : READING**

**(20 Marks)**

**1.** Read the passage given below and answer the questions that follow:

**12 marks**

- (1) One afternoon Mr. Ras Mohun took those of us boys who were visually challenged behind the school building to a little vacant area behind the wall of the Tata mill. Here he let us feel four waist high metal wires and what he called the starting and finishing poles, between which the wires had been strung. The wires formed three long lanes, each a few feet wide. Each wire had a hoop about the size of a thick bangle hanging from it.
- (2) “It is modelled on a racing track for the blind which I saw at Perkins in America. We will have races for you here every week.”
- (3) Mr. Ras Mohun positioned Abdul, Reuben and me in separate lanes, at the starting posts, and showed us how to catch hold of the metal hoop by a string that hung from it, and then run with the wire as our guide.
- (4) Mr. Ras Mohun called out “Ready, steady, go !”
- (5) I had never run so fast. I imagined myself an arrow flying from one post to the other.
- (6) “Oh, my God, they are going to kill themselves !” I heard Mr. Ras Mohun exclaim as I fell sidewise, almost wrapping myself around the finishing post and hitting my mouth on it.
- (7) “Any of you badly hurt ?” Mr. Ras Mohun asked running up to us.

- (8) All three of us had bleeding mouths and bleeding foreheads. There had been no way for us to know when we were coming to an end so we had all fallen down and hurt ourselves at the finishing post.
- (9) Mr. Ras Mohun sent for tincture of iodine and bandages and after he had attended to our injuries he said almost to himself, “Bless me, I can’t remember how they prevented such mishaps at Perkins.” He paused and then went on to us. “I know. I’ll station the Sighted Master at the finishing post with my bell. He can ring it during the races. From the sound of the ringing you will know how close you are to the end. As an added precaution, I’ll have a nice strong rope stretched across the lanes at the height of the wires just before the end so that if you fall you won’t hit the finishing post.”
- (10) After that every Saturday we had racing at the racing track. Mr. Ras Mohun would stand at the starting posts and get us off, and the Sighted Master would stand at the finishing post, behind the newly stretched rope and ring the bell. Abdul, Reuben and I were the three fastest runners, and whenever the school had visitors we three would be asked to put on a special racing exhibition, running different kinds of races we had learnt.
- (11) As time went on, the boys from a sighted school nearby came and joined us at our Saturday races. They would run outside the lanes. I was so eager to compete with them on even terms that now and again I would slyly let go of the string and hurl the hoop forward, so that I could run along the track like them for a time.

*An extract from ‘Vedi’ by Ved Mehta*

- (a) On the basis of your understanding of the passage, answer the following in your own words:
- (i) Why did Mr. Ras Mohun string a wire with hoops on the racing tracks? 1
- (ii) What were the two instructions given to the boys before the trial race? 2
- (iii) Did the trial race go according to the expectation of the teacher? Why / Why not? 1
- (iv) What steps did Mr. Ras Mohun take to ensure that the boys did not face the problems that they had faced in their first race? 2
- (v) Why were the narrator and his friends asked to race whenever there were visitors in school? 1



(vi) The narrator mentions that he would often leave the string and run without any support. Why did he do this ?

1

(b) Pick out words/phrases from the passage which are similar in meaning to the following:

1 x 4 = 4

(i) a large ring (para 1)

(ii) based on / inspired from (para 2)

(iii) used for covering / in order to protect (para 6)

(iv) accidents (para 9)

2. Read the passage given below and answer the questions that follow:

8 marks

How many times have we seen more-than-chubby children, pulled their cheeks lovingly, and exclaimed, "How cute !" It's time for a reality check. Childhood obesity is on a rapid rise in this country, in keeping with an unhealthy global trend: in 2007, an estimated 22 million children under the age of five years were overweight according to the World Health Organisation, and more are expected to join the obese club.

In an alarming report presented by the Indian Heart Association, the thickness of the artery walls of teenagers who are obese were reported to resemble the thickness of an average 45-year-old's artery walls. In other words, evidence was presented that obese children show early warning signs of heart disease. Childhood obesity is also linked to other serious health complications including juvenile diabetes. We can no longer dismiss it as a problem of the West. We might not be grappling with a problem as huge as in the US - where childhood obesity is considered an epidemic - or in the UK. But trouble is knocking on our doors, as well as those of other developing countries like China, Brazil and Thailand.

A recent 'Indian Pediatrics' report makes this point. Unlike in much of the West, where childhood obesity is more prevalent among low-income groups, in India it is a malaise that afflicts the better off. The prevalence of obesity is higher in the upper socio-economic class (4.8 per cent) as compared to the lower socio-economic class (1 per cent). In urban Delhi, about 37 per cent of children are either overweight or obese. Medical experts attribute the weighty troubles of developing countries to changed dietary habits - an overdose of fast and processed foods - and a steep drop in levels of physical activity.

An unhealthy diet is partly a function of the greater access and choice that the expanding middle class has. And partly because of the compulsions of modern urban

life, where both parents often work and prefer quick and easy processed food options rather than cooking every meal from scratch. City children today are also more inclined to spend leisure as couch or mouse potatoes, which does not help in the battle against the bulge. Concerted efforts involving schools, families and government to tackle juvenile obesity are in order. For a start, policymakers must invest in educating parents, especially mothers, about the perils of childhood obesity. And it would be of immense help if we, as a society, got over our peculiar proclivity to associate overweight - especially when it concerns children - with 'well-fed' and 'healthy'.

- (a) On the basis of your reading of the above passage, make notes on it using headings and sub-headings. Use recognizable abbreviations wherever necessary. 5
- (b) Using the notes write a summary of the above passage in 80 words. 3

**SECTION - B (Writing)**

**25 Marks**

3. You are disturbed after visiting a slum area wherein some children do not go to school. Many organizations have come forward with the idea of 'Education for All'. In spite of their best efforts it is still a dream. Design a poster suggesting ideas to make it a reality as education is the only way to progress. 5 marks

**OR**

Your school is celebrating its Golden Jubilee Year and staging the play, 'Alexander the Great' on its annual day. Mr. Abraham, the famous playwright has consented to be the Chief Guest. Invent the relevant details and draft the invitation card for the occasion. (Word limit - 50)

4. Career Counselling workshops have become a regular feature for the students of senior classes (X-XII) in most reputed schools of today. You are Rahul/Rama, a student of class XII of New Model Secondary School, Pune. Write a letter to the editor of a national daily expressing your views on the utility of such workshops in conducting tests to determine one's potential as well as inclination and in making the students aware of the evolving career options of today. 10 marks

**OR**

You are Ritwik/Raveena, staying at D-74 Friends Colony, New Delhi. You came across the following advertisement in 'The Times of India' on December 2, 2009.

Destination Moon! Destination Mars!

The Indian Space Odyssey is set to conquer many new frontiers.

Welcome aboard.

To begin a most exciting journey!

Join IIST, Sign up for ISRO

Write a letter of enquiry to the Director, Indian Institute of Space Science and Technology, Thiruvananthapuram, asking for details of the programmes offered, entrance examination to be held, duration, course fees and placement service provided.

5. The aim of a progressive educator is to provide learning in a stress-free environment. A congenial environment plays a major role in a child's holistic development. Write an article on the topic, 'Role of Environment in Holistic Growth' in 200 words. Use the input given below:

**10 marks**

Favourable environment - unleashes full potential of child - learning without stress and fear - maximum output - child happy and relaxed - healthy competition

**OR**

You are Vinod/Vimla, a student of Futuristic Public School, New Delhi. Prepare a speech for the assembly in not more than 200 words on the following topic:

'Commercial Advertisements: a Boon or a Curse of the 21st Century'. Use the input given below:

- Attractive advertisements - glorify product in a consumerist society - do not give full information - people easily duped-cause greed and dissatisfaction if unaffordable
- Create general awareness - make it possible to compare products and services

**SECTION - C (Grammar)**

**20 Marks**

6. Rearrange the following sentences sequentially to make complete sense. It describes the stages of writing a biography:

**5 marks**

- (a) Finally, he fits the details in such a way that it fits into an understandable moving whole.

- (b) Then he looks for evidence for inner truths-feelings and desires.
- (c) Biography is both a craft and an art.
- (d) A biographer begins with research, gathering all the available information about a person's life.
- (e) With all the collected information he proceeds to write the story.

7. This year, Bravery Award winners included six year old twins who saved a child from a bull and a ten year old boy who foiled a robbery attempt. As a young reporter, talk to some of the award winners. Prepare a set of five questions.

**5 marks**

Example: Good morning, congratulations for the award.

Thanks, I am quite happy.

Narrate your act of courage

Saw a bull charging, foiled a robbery

Your thoughts

Saving people

Scared

No, thought of helping

what inspired you

fearlessness, stories of valour

in future if any other opportunity

no hesitation in helping

8. The following passage has ten errors. Identify the errors in each line and write them along with the corrections as shown in the example:

**5 marks**

	Incorrect	Correct
According to the UNICEF report more than	the	a
(1) a third of the world child brides are from India,		
(2) leaving children at an increased risk on exploitation		
(3) despite the country's growing modernity but economic		
(4) wealth. Nearly 25 million women over India were married		
(5) in 2007 by the age of 18, said the report, who noted that		

- (6) children in India, Nepal and Pakistan will be engaged or
- (7) even married before they turn 10. Millions of children are
- (8) also being forced to work in harmful condition, or face violence
- (9) and abuse at home and outside, suffer physical and
- (10) psychological harm beside wide-reaching effects, the report said.

9. **Saina Nehwal** is an Indian badminton player. Currently ranked number 6 in the world by Badminton World Federation, Saina is the first Indian woman to reach the 'singles quarterfinals at the Olympics and the first Indian to win the World Junior Badminton Championship. You are Kamal/Kavita a reporter for Times Today. You have to interview Saina. Frame 10 interview questions based on the given input.

**5 marks**

born in Hisar, Haryana and spent her life in city of Hyderabad; wake up at 6 every morning and head to the stadium 20 km away - two hours of practice - travelling nearly 50 km a day to accommodate the training schedule - extra training sessions; rising cost of her training - Saina's father withdrew money from his savings 2002; sports brand Yonex offered to sponsor Saina's kit; in 2005 spotted by Mittal trust; in 2006 first Indian woman to win a 4-star tournament; Phillipines Open-entering the tournament as the 86th seed, stun several top seeded players; the Most promising player in 2008; rewarded with Arjuna Award in August, 2009; her coach, Shri Gopichand was also rewarded with Dronacharya Award at the same time.

**SECTION -D (Literature)**

**35 Marks**

10. Choose any **one** of the extract and answer the questions that follow:

**7 marks**

Who hath not seen thee oft amid thy store?

Sometimes whoever seeks abroad may find

Thee sitting careless on a granary floor

Thy hair soft-lifted by the winnowing wind;

- (a) Who is the person being addressed to in these lines as 'thee' ? What is the poetic device used here?
- (b) What is the person referred to in these lines doing? Why is her/his hair being lifted?
- (c) What are the other activities the person is involved in ?

$\frac{1}{2} + \frac{1}{2} = 1$

$1 + 1 = 2$

**2**

- (d) How are the activities mentioned in these lines different from those taking place before this as described in the first stanza? 1 + 1 = 2

**OR**

Incredulously the laced fingers loosen

Slowly sensation by sensation from their warm interchange

And stiffen like frosted flowers in a November garden

- (a) Name the poem and the poet. 1
- (b) What is being described in the above lines? 1
- (c) Pick out the poetic device in the above lines and name it.  $\frac{1}{2} + \frac{1}{2} = 1$
- (d) Explain the term 'stiffen like frosted flowers in the November garden'. 2
- (e) Why has the narrator used the word 'incredulously' ? 2
11. Answer any two of the following in not more than 50 words each: 2 x 4 = 8 marks
- (a) What are the reasons that make fighting in a war traumatic for the combatants?
- (b) How do we know that the bird in the poem, 'Sympathy' has a never-say-die spirit and is not ready to give up without a fight?
- (c) Describe any two similes used in the poem, 'Ars Poetica' which bring out the qualities of a good poem.

12. Answer the following question: 5 marks

'Once you had started you had to go on. There was no turning back.'

- (a) Who said these words? To whom were they spoken ?  $\frac{1}{2} + \frac{1}{2} = 1$
- (b) Why does the speaker make this comment? 2
- (c) Do you think the speaker was right in his/her assessment? Give reasons for your answer. 2

**OR**

Mr. White: "Ay, I had a bad night"

Mrs. White: "It was the storm I expect"

Was Mr. White's sleep disturbed because of the storm? Give reasons for your answer. Answer in 80-100 words.

13. Answer any **two** of the following in about 50 words each: **2 x 4 = 8 marks**

- (a) How did Lisa become a real actress?
- (b) What sort of an environment should a school provide a student to make them perform a task well, according to Einstein?
- (c) Why was the young boy sitting in the litchi tree in the lesson, 'What's Your Dream' ?

14. Answer the following question in 100-125 words: **7 marks**

After meeting the comedians and agreeing to allow Robichon to masquerade as him at Appeville Sous Bois, Jacques Roux writes a diary entry recording the reasons why he approached the comedians, his feelings at Robichon's proposal and his reason for agreeing to it. Write the diary entry.

**OR**

Mrs. Malik and her daughter-in-law are quite similar to one another. Do you agree? Give your opinion about this statement.

**QUESTION PAPER CODE 212**  
**SECTION A : READING**

1. Read the following passage and answer the questions that follow: **12 marks**

- 1 Why should I meet young students in particular? Seeking the answer I went back to my student days. From the island of Rameswaram, what a great journey it's been! Looking back it all seems quite incredible.
- 2 What was it that made it possible? Hard work? Ambition? Many things come to my mind. I feel the most important thing was that I always assessed my worth by the value of my contribution. The fundamental thing is that you must know that you deserve the good things of life, the benefits that God bestows. Unless our students and young believe that they are worthy of being citizens of a developed India, how will they ever be responsible and enlightened citizens?
- 3 There is nothing mysterious about the abundance in developed nations. The historic fact is that the people of these nations - the G8 as they are called - believed over many generations that they must live a good life in a strong and prosperous nation. The reality became aligned with their aspirations.
- 4 I do not think that abundance and spirituality are mutually exclusive or that it is wrong to desire material things. For instance, while I personally cherish a

life with minimum of possessions, I admire abundance, for it brings along with it security and confidence, and these eventually help preserve our freedom. Nature too does not do anything by half measures, as you will see if you look around you. Go to a garden. In season, there is a profusion of flowers. Or look up. The universe stretches into infinitude, vast beyond belief.

- 5 All that we see in the world is an embodiment of energy. We are a part of the cosmic energy too, as Sri Aurobindo says. Therefore when we begin to appreciate that spirit and matter are both part of existence, are in harmony with each other, we shall realize that it is wrong to feel that it is somehow shameful or non-spiritual to desire material things.
- 6 Yet, this is what we are often led to believe. Certainly there is nothing wrong with an attitude of making do with the minimum, in leading a life of asceticism. It has to be a matter of choice. You follow such a lifestyle because it answers a need that arises from deep within you. However, making a virtue of sacrifice and what is forced upon you - to celebrate suffering - is a different thing altogether.
- 7 This was the basis of my decision to contact our young. To know their dreams and tell them that it is perfectly all right to dream of a good life, an abundant life, a life full of pleasures and comforts, and work for that golden era. Whatever you do must come from the heart, express your spirit, and thereby you will also spread love and joy around you.

- An excerpt from 'Ignited Minds'

- (a) On the basis of your understanding of the passage, answer the following questions:
- |  |   |
|--|---|
| (i) Which journey is the author talking about? What has been its purpose ?   | 2 |
| (ii) Name four things that contribute to progress in one's life.             | 2 |
| (iii) What is the secret behind the affluence of developed nations?          | 1 |
| (iv) Which common notion does the author challenge? How does he justify it ? | 2 |
| (v) What message does the author give to the young people?                   | 1 |
- (b) Pick out the words which mean the opposite of the following: 1x4 = 4
- |                            |  |
|----------------------------|--|
| (i) Ignorant (para 2)      |  |
| (ii) Scarcity (para 4)     |  |
| (iii) Condemn (para 5)     |  |
| (iv) Epicureanism (para 6) |  |



2. Read the passage and answer the questions that follow:

8 marks

The modern garden has a history going back many thousands of years. Early humans were hunters and gatherers and usually did not stay in one place for a long time. Instead, they travelled from place to place following the food (plants and animals) according to the seasons. During the Neolithic period this slowly began to change; humans started to domesticate certain plants which meant they could remain in one place and grow their own food. The first 'garden' was a vegetable garden, where early humans cultivated different types of plants for food.

Evidence of early agriculture includes edible plants such as wheat and lentils and also includes more ornamental plants for decorative purposes. Plants for medicine were grown as were herbs and spices for flavouring or preserving food.

Certain plants also had religious or spiritual value and were not only grown because they were useful or edible but had a religious significance. They were planted to honour the Gods or used in religious ceremonies. Certain plants were sacred, for instance the tulsi. The ancient Greeks planted groves for their Gods, and many cultures believed that gardens were holy.

Gardens were a way to show that their owners were rich or powerful. Ancient rulers created huge gardens to display their wealth, in the same way that large places were symbols of prosperity. Sir Francis Bacon described gardens as "purest of human pleasures." The ancient Greeks believed that growing food was a job for the poor but gardens were places for enjoyment and contemplation. The English word 'Paradise' comes from the Persian word 'Pairidaeza' meaning a walled space; garden. One of the most famous early gardens was the Hanging Garden of Babylon. One of the Seven Wonders of the Ancient World, it was created 2,600 years ago, near the river Euphrates. It was designed so that the river could continually irrigate it and as a result was green all year around.

As gardens have developed over the years, design and beauty have become more and more important. Humans have learnt about Nature and to design gardens precisely, like a work of art or building. The gardens of Versailles, in France and our very own Mughal Gardens at the Rashtrapati Bhavan are excellent examples of "Garden Architecture" - everything is symmetrical and even the trees are pruned to fit in with the design.

Carefully planned or not, gardens are still beautiful and relaxing places to visit. On a fine day you might even find a little part of Paradise if you look hard.

- (a) On the basis of your reading of the above passage, make notes on it using headings and sub-headings. Use recognizable abbreviations wherever necessary. 5
- (b) Using the notes write a summary of the above passage in 80 words. 3

**SECTION B - WRITING**

**25 Marks**

3. Rosalind/Ravi is very excited on moving into a room of her/his own in the college she/he has just joined after passing out of school. She/He writes a description of the room in her/his diary. You are Rosalind/ Ravi. Write the description in not more than 80 words.

5 marks

**OR**

You are a member of your school environment club. On the occasion of 'World Save Energy Day' you and the other club members decide to create awareness about the urgent need to conserve electricity by designing a poster highlighting the merits of conserving electricity. Design the poster in not more than 50 words.

4. Career Counselling workshops have become a regular feature for the students of senior classes (X - XII) in most reputed schools of today. You are Rahul/Rama, a student of class XII of New Model Secondary School, Pune. Write a letter to the editor of a national daily expressing your views on the utility of such workshops in conducting tests to determine one's potential as well as inclination and in making the students aware of the evolving career options of today.

10 marks

**OR**

You are Ritwik/Raveena, staying at D-74 Friends Colony, New Delhi. You came across the following advertisement in 'The Times of India' on December 2, 2009.

Destination Moon! Destination Mars!  
The Indian Space Odyssey is set to conquer many new frontiers.  
Welcome aboard. To begin a most exciting journey!  
Join IIST, Sign up for ISRO

Write a letter of enquiry to the Director, Indian Institute of Space Science and Technology, Thiruvananthapuram, asking for details of the programmes offered, entrance examination to be held, duration, course fees and placement service provided.

5. The aim of a progressive educator is to provide learning in a stress-free environment. A congenial environment plays a major role in a child's holistic development. Write an article on the topic 'Role of Environment in Holistic Growth' in 200 words. Use the input given below:

10 marks

Favourable environment - unleashes full potential of child -  
learning without stress and fear - maximum output - child happy  
and relaxed - healthy competition

**OR**

You are Vinod/Vimla, a student of New Era Public School, New Delhi. Prepare a speech for the assembly in not more than 200 words on the following topic: 'Commercial Advertisements: a boon or a curse of the 21st century'. Use the input given below:

- Attractive advertisements - glorify product in a consumerist society - do not give full information - people easily duped - cause greed and dissatisfaction if unaffordable
- Create general awareness - make it possible to compare products and services

**SECTION C - GRAMMAR**

**20 Marks**

6. Rearrange the following sentences sequentially to make complete sense: 5 marks
- (a) Elizabeth was in the audience and felt inspired.
  - (b) On growing up, Elizabeth realized that there was only one registered woman doctor in the world - Elizabeth Blackwell.
  - (c) She argued with her father that if women could become efficient nurses like Florence Nightingale, why couldn't they become doctors.
  - (d) When Blackwell visited England she gave a lecture on "Medicine as a profession for ladies".
  - (e) Elizabeth Garrett Anderson was born in a rich family, in 1836.

7. Gayatri has approached the school counsellor Mrs. C to discuss some problems that she is facing at home. Make five sets of exchanges based on the cues given below. The first one has been done for you as an example: 5 marks

Feeling misunderstood / parents think not studying enough / rude to parents / not dressing appropriately / not helping in housework / talking too much on the phone

*Mrs. C* : Hello Gayatri. What makes you so sad today?

*Gayatri* : The problem is not new. I feel so misunderstood especially at home.

8. The following passage has ten errors. Identify the errors in each line and write them along with the corrections as shown in the example : 5 marks

To being able to fly like a bird is the dream of many.                                  being          be

1. Birds are mysterious creatures. They didn't have
2. houses. So where do they store food? Under their
3. throat! Birds has a bulge below their throat
4. called a 'Storage Bag' and food stays there and
5. must be coughed up for chicks to eat. Not having teeth
6. is not a problem for it. They have a special grinding
7. organ called a gizzard. Food is crush by the muscles
8. as they moves around the gizzard. Some birds swallow
9. grit and small stones, this stay in the gizzard and help
10. to grind up the food. They will also store this flying fuel in tiny sacs all over their body.

9. You are Madhu working with a company conducting market research to find out what people look for when buying clothes. Frame ten questions that you would like to ask the people in your city/town. Some cues have been given to help you prepare the questionnaire.

5 marks

material; price; brand; style; fashion; utility; colour; design; influences-parents / friends / others; place you buy it from-boutiques / malls / small shops;
--

### SECTION D - LITERATURE

35 Marks

10. Choose any **one** of the following extracts and answer the questions that follow:

7 marks

Their dreams that drip with murder; and they'll be proud

Of glorious war that shatter'd all their pride...

Men who went out to battle, grim and glad;

Children, with eyes that hate you, broken and mad

- |   |   |
|---|---|
| (a) What is the theme of the poem?                                      | 1 |
| (b) Who does 'Their' refer to in the first line? What do they dream of? | 2 |
| (c) Explain the irony in the second line.                               | 2 |
| (d) Who does the narrator refer to as children? Why?                    | 2 |

**OR**

And is there cause for sorrow  
That in the one small white murder of one kiss  
Are born two ghosts, two Hamlets, two soliloquies,  
Two worlds apart tomorrow?

- (a) Pick up an example of irony from the above lines and explain it. 2
- (b) What is a soliloquy? Who does the word 'two' refer to? 1 + 1 = 2
- (c) Who are the two ghosts and why are they being referred to as Hamlets? 2
- (d) Quote the lines that convey the theme of the poem. 1
- 11.** Answer any **two** of the following in not more than 50 words each: 2x4 = 8 marks
- (a) Autumn is a season of abundance and joy with an underlying sense of sadness. Discuss with reference to the poem, 'Ode to Autumn'.
- (b) What are the feelings of the narrator towards his mother as expressed in the poem, 'Of Mothers, Among Other Things'? Give examples from the poem to justify your answer.
- (c) What does the narrator of the poem, 'Sally in our Alley' want to convey through this line - 'But sure such folks could ne'er beget so sweet a girl as Sally.'? How does he spend time with Sally?

- 12.** Answer anyone of the following in 80 - 100 words: 5 marks
- 'This will be my last act of mercy.'
- How is this statement made by the speaker ironical?

**OR**

What was the second wish made on the monkey's paw? Why was it made? What was the result?

- 13.** Answer any **two** of the following in about 50 words each: 2x4 = 8 marks
- (a) Who were the Censors of Piety and what role did they play in the administration of Asoka's kingdom?
- (b) How does the story, 'Grief' convey the insensitive nature of humans?
- (c) Why does Mrs. Malik feel that the architect had been mocking her all these years?

14. Answer any **one** of the following in 100 - 125 words:

7 marks

Compare and contrast the characters of the two actresses – Lisa from the story, 'The Actress' and Suzanne from the story, 'The Judgement of Paris',

**OR**

Discuss the memories that Robert Lynd has of his childhood. Why does he call some of them 'illusions' ?

## Marking Scheme — Functional English

### *General Instructions :*

1. The Marking Scheme carries only suggested value points for the answers. These are only guidelines and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the marks be awarded accordingly.
2. Answer scripts should not be given to the evaluators for evaluation until and unless the given Marking Scheme has been thoroughly discussed with them in a group or individually on the first day of evaluation.
3. The Head Examiner must go through the first five answer scripts evaluated by each evaluator to ensure that the evaluation has been carried out as per the Marking Scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
4. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. However, the Marking Scheme carries only suggested value points and does not constitute the complete answer.
5. If a question has parts, please award marks on the right hand side for each part. Marks awarded for different parts of the question should then be totalled up and written in the left hand margin and circled.
6. If a question does not have any parts, marks must be awarded in the left-hand margin.
7. Where marks are allotted separately for content and expression as per the Marking Scheme they have to be reflected separately and then totalled. **This is a mandatory requirement.**
8. A slash (/) in the Marking Scheme indicates alternative answer. If a student writes an answer which is not given in the Marking Scheme but which is equally acceptable, marks should be awarded only in consultation with the Head Examiner.
9. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.
10. If a student writes a single word in response to a short answer type question and it constitutes the core of the answer it should be accepted and awarded full marks.

11. If a student literally lifts a portion of the given passage as an answer to a question, no marks should be deducted for this so long as it is relevant and indicative of the desired understanding on the part of the student especially in Q.1 (Section A) and Q.11 (Section D).
12. Some of the questions may relate to Higher Order Thinking Skills. These, questions are to be evaluated carefully and the student's understanding/analytical ability may be judged.
13. Wherever the word limit is given, no marks to be deducted for exceeding the word limit. However, due credit should be given for precise answers.

QUESTION PAPER CODE 212/1

**EXPECTED ANSWERS/VALUE POINTS**

**SECTION A: (READING) 20 Marks**

**Q1. READING**

**RAS MOHUN**

**TOTAL MARKS : 12**

Under Section A, Reading (Q1) question has been designed to test a student's understanding of the passage and his/her ability to interpret, evaluate and respond to the given passage. As such, content assumes more importance than expression in the answers to these questions. Please do not hesitate to award full marks if the answer deserves it.

**Objective :** To identify and understand main parts of the text.

**Marking :** As marked in the question paper. No penalty for spelling and grammar.

Accept any other word equivalent in meaning to the answers given below.

**Answers :**

- |    |      |  |                  |
|----|------|--|------------------|
| a) | i.   | ● because boys were visually challenged/<br>● to help them run in their tracks (any 1)   | 1 mark           |
|    | ii.  | ● told them to hold metal hoop by string<br>● run with the wire as guide   | 1 mark<br>1 mark |
|    | iii. | ● yes, boys could run fast in their respective tracks /<br>● no. boys were badly hurt (either yes or no with justification)                                    | 1 mark           |
|    | iv.  | ● stationed Sighted Master at finishing post with bell<br>● stretched strong rope at finishing point   | 1 mark<br>1 mark |
|    | v.   | ● novelty / showcased efforts of school to help visually challenged /<br>● the three were the fastest runners skilled at different kinds of races.<br>(any 1 ) | 1 mark           |



- vi. ● wanted to behave like a normal child/wanted to compete on even terms
- they had become so used to running in the tracks that he could run even without the string (anyone)

1 mark

**(b) VOCABULARY**

**Objective :** To deduce the meanings of unfamiliar lexical items.

**Marking :** 1 mark each (4 marks)

- Answers :** b)
1. hoop
  2. modelled
  3. Wrapping
  4. mishaps

**Q 2. Note making and Summarizing**

**Total Marks: 8**

**Objective :** To develop the skill of taking down notes

To develop the extracted ideas into a sustained piece of writing.

**Marking : Note making**

**5 marks**

Heading	1 mark
Abbreviations / Symbols (with or without key) (minimum four)	1 mark
Content (minimum three sub headings)	3 marks

**Important instructions:**

The notes provided below are only guidelines. Any other title, main points and sub points should be accepted if they are indicative of the students' understanding of the given passage and the notes include the main points with suitable and recognizable abbreviations.

**Complete sentences should not be accepted as notes. Half a mark should be deducted from the total if the student writes complete sentences.**

**Numbering of points can be indicated in different ways and these should be accepted as long as it follows a consistent pattern.**

(a) **Note making**

**Note: If the student has attempted only the summary or only the notes, due credit should be given.**

**Suggested Notes**

**Title : Childhood Obesity**

1. Unhealthy global trends / Reality check
  - a. 2007-22 million children below 5yrs obese
2. Complications
  - a. thickness of artery like 45 yr old
  - b. juv. diabetes
    - i. problem of the west-US, UK
    - ii. developing countries -Brazil, Thailand, China
3. Obesity in India
  - i. prevalent among upper socio economic class
  - ii. urban Delhi-37% youngsters overweight
4. Reasons for rise in obesity
  - a. changed dietary habits
    - i. access and choice of middle class
    - ii. compulsion of mod. upper class
    - iii. parents working
    - iv. prefer easy processed food
  - b. drop in physical activity
5. Measures to fight obesity
  - a. concerted efforts of govt. schools, families
  - b. educate parents
  - c. not associate overweight with being 'healthy'

**Key to Abbreviations**

1. yrs. - years
2. juv. - juvenile
3. & - and
4. govt. - government
5. mod. - modern

- Note:** 1. Any abbreviations done by the students should be accepted.  
 2. No student to be penalized if they have not given a key to abbreviations.

**(b) SUMMARY**

- Objective: 1) To expand notes (headings and sub-headings) into a summary  
 2) To test ability of extraction

Marking:	Content	2 marks
	Expression	1 mark

**Note:** Considering the numerous facts mentioned in the notes about obesity, due consideration should be given to the students if they do not cover all the points in the summary which is expected to be concise. The summary should cover the essential details only.

**SECTION B (WRITING) TOTAL - 25 MARKS**

In Section B, where questions have been designed to test the writing skills of the students, expression (grammatical accuracy, appropriate vocabulary and style, spellings, organization and presentation of relevant matter in a coherent and logical way) is important.

**Q.3. OPTION-1**

**POSTER EDUCATION FOR ALL TOTAL - 5 MARKS**

**Objective:** To write in an appropriate style of a poster (blurbs, bullets, different font size etc. may be considered)

**Marking:** Content 3 marks  
 (To include heading and issuing authority)

**Suggested Value Points**

1. create awareness about education
2. importance of education
3. steps /measures to spread education
4. appropriate slogans

**Expression** Coherence and relevance of ideas, accuracy and style 2 marks  
 Due credit should be given for creativity and economy of words

**Option-2**

**FORMAL INVITATION CARD**

**TOTAL - 5 MARKS**

**Objective:** To use an appropriate style to draft a formal card

**Marking:**

**Format**

**1 mark**

name of the organizers

½ mark

mentioning RSVP with name/phone no.

½ mark

**Content**

**2 marks**

● mention the event - play “Alexander”

½ mark

● time, date, venue

½ mark

● purpose of the invitation – Golden Jubilee

½ mark

● name of chief guest Mr. Abraham

½ mark

**Expression**

● Coherence and relevance of ideas and style

**2 marks**

**Q.4. Option -1**

**LETTER TO THE EDITOR - CAREER COUNSELLING**

**TOTAL -10 MARKS**

**Objectives:** To use an appropriate style to write a formal letter.  
To plan, organize and present ideas coherently

**Marking:**

**Format**

**2 marks**

( 1. sender’s address, 2. date

3. address of the addressee

4. salutation. 5. subject

6. complimentary close

7. sender’s signature/name)

**Content**

**4 marks**

**Suggested value points**

- mention of counselling workshops- regular feature
- utility of such workshops
- advantages
- disadvantages (if any)

**Expression:** **4 marks**

- Grammatical accuracy, appropriate words and spellings 2 marks
- coherence and relevance of ideas and style 2 marks

**Or**

**Option -2**

**LETTER SEEKING INFORMATION - INSTITUTE OF SPACE SCIENCE**

**TOTAL -10 MARKS**

**Objectives:** To use an appropriate style to write a formal letter

To plan, organize and present ideas coherently

**Marking: Format** 2 marks

1. sender's address
2. date
3. address of the addressee
4. salutation
5. subject
6. complimentary close
7. sender's signature/name

**Content** 4 marks

**Suggested value points**

- asking for details of programs offered
- entrance examination (date, time, venue)
- duration of the course
- fee structure
- placement opportunities
- other relevant questions

**Expression** 4 marks

- Grammatical accuracy, appropriate words and spellings 2 marks
- coherence and relevance of ideas and style 2 marks

**Q.5. Option -1**

**ARTICLE – ROLE OF ENVIRONMENT ON HOLISTIC GROWTH**

**Objective:** To write in a style appropriate to the given situation.

To plan, organize and present ideas coherently.

<b>Marking: Format</b>		1 mark
heading and writer's name		
<b>Content</b>		4 marks
<b>Expression</b>		5 marks
(Grammatical accuracy,		
appropriate words and spellings	2 ½ marks	
coherence and relevance of ideas and style	2 ½ marks	
<b>Suggested value points</b>		
- importance of favourable environment		
- effect on child's potential		
- stress free learning leads to maximum output		
- leads to healthy competition		
(any other relevant point)		

**Option - 2**

**SPEECH - COMMERCIAL ADVERTISEMENTS - BOON OR CURSE**

**TOTAL - 10 MARKS**

**Objective:** To write in a style appropriate to the given situation.  
To plan, organize and present ideas coherently.

**Marking: Content** 5 marks  
(to include greeting and thanking)

**Suggested Value points**

**Any view point based on given input**

Curse

- attractive advertisements, glorify products
- incomplete information, people duped
- leading to greed/dissatisfaction, if unaffordable

Boon

- create awareness
- make it possible to compare products
- improve products/services / quality
- educates society

**Expression** 5 marks

- Grammatical accuracy, appropriate words and spellings 2½ marks
- coherence and relevance of ideas and style 2½ marks

**SECTION C (GRAMMAR)**

**20 MARKS**

In Section C care should be taken not to award marks to any inaccurate answer carrying errors in grammar and punctuation.

**Q6. REARRANGING**

**TOTAL: 5 MARKS**

**Objectives:** To be able to present ideas in grammatically logical sequence

5 marks

**Marking:** 1 mark for every correct answer

**Answer**

- (c) Biography is both a craft and an art
- (d) A biographer begins with research, gathering all the available information about a person's life
- (b) Then he looks for evidence for inner truths - feelings and desires
- (c) with all the collected information he proceeds to write a story
- (a) Finally he fits the details in such a way that it fits into an understandable moving whole

**Q7. DIALOGUE WRITING**

**TOTAL-5 MARKS**

**Objectives:** To be able to extend a situation into a meaningful dialogue.

**Marking:** 1 mark each for every correct exchange provided it is accurately and appropriately expressed. No marks should be awarded if there is any inaccuracy. This includes inaccuracies in grammar, spelling or punctuation. 5 marks

**Note:** **The dialogues could include conversation with both the twins / either of the twins / each twin separately or any other award winner**

**Marks have to be awarded if a student has framed 5 questions instead of 5 sets of exchanges**

### Sample Answers

1. Q: Would you like to narrate your act of courage?  
A: I saved a child from a charging bull/ foiled a robbery /  
I saved a child from a charging bull and foiled a robbery.
2. Q: What were your thoughts at that time?  
A: I wanted to save the people/child.
3. Q: Were you scared?  
A: No. I only thought of helping the boy / people / child.
4. Q: What inspired you?  
A: My fearlessness and stories of valour read by me.
5. Q: Would you do the same in future?  
A: Yes, I will not hesitate to help those in trouble.

### Q.8. EDITING

**TOTAL: 5 MARKS**

**Objectives:** To use grammatical items appropriately

**Marking:** ½ mark each

If the candidate copies the sentence and replaces the incorrect word with the correct answer marks should be awarded. However no marks are to be deducted if the candidate has given only the correct words.

	<u>Incorrect</u>	–	<u>Correct</u>
1.	World	–	world's
2.	on	–	of
3.	but	–	and
4.	over	–	in
5.	who	–	which
6.	will	–	would
	in	–	from
	no error		
	will be	–	were / are
7.	turn	–	turned / no error
8.	condition	–	conditions
9.	suffer	–	suffering
10.	beside	–	besides

**Note: Sentence 6 has 4 options as indicated above**

**Sentence 7 has 2 options as indicated above**



**Q9. FRAMING QUESTIONS****TOTAL-5 MARKS****Objectives:** To understand the context and frame relevant and appropriate questions.**Marking:** ½ mark each for every accurate question framed**Note:** No marks to be awarded if there is any inaccuracy. The ten questions should cover at least two of the areas specified for the interview in the given input. Any other suitable questions may be acceptable**SECTION D: LITERATURE****TOTAL -35 MARKS****Q10. REFERENCE TO CONTEXT****TOTAL- 7 MARKS**

Under Section D. (Q10) question has been designed to test a students' understanding of the passage and his/her ability to interpret, evaluate and respond to the given passage. As such content assumes more importance than expression in the answers to these questions. Please do not hesitate to award full marks If the answer deserves it.

**Objective:** To test students' comprehension of poetry- local. Global, interpretative. inferential and evaluative**Marking:** 7 marks**OPTION (1) ODE TO AUTUMN**

- a) Autumn; personification ½ + ½ mark
- b) sitting on the granary floor, hair lifted in the wind 1 + 1 mark
- c) sitting, winnowing, reaping, harvesting, gleaning, sleeping, watching the cider press  
(any four) ½ + ½ + ½ + ½ mark
- d) It is more slow paced, lethargic, earlier it was hectic / The mentioned activities are all farming activities In preceding stanza the ripening and swelling of fruits and vegetables, blooming of flowers, collection of nectar by bees, is described 1 + 1 mark

**OPTION (2) CURTAIN**

- a) Curtain - Helen Spalding ½ + ½ mark
- b) separation of two lovers 1 mark
- c) “stiffen like frosted flowers in a November garden”; simile ½ + ½ mark

- d) It refers to the emotional state of two lovers which becomes cold and numb due to the pain and shock caused by the separation 1 + 1 mark
- e) To show how unbelievable, difficult to understand / sudden / shocking the separation has been / how quickly the emotions have changed for the lovers (any two) 1 + 1 mark

### Q11. POETRY

**TOTAL 4X2 = 8 MARKS**

**Objectives:** To test students' comprehension of poetry - local and global

**Marking:** Content: 3 marks

Expression: 1 mark

- a) They lose their friends;
- are haunted by the scenes of war / ghosts of dead companion .
  - realize war was not glorious after all / disillusionment/ indifference of the politicians and non-combatants
  - suffer from neurasthesia / shell shock / physical, emotional and mental injuries
- (any three)
- b) He keeps on beating against the bars of his cage / doesnot give up
- wings wounded, bleed openly, causing old scars to open
  - sends a prayer begging and hoping for freedom (any three)
- c) Poem has been compared to
- globed fruit - showing it is something to be relished and is complete in itself
- medallion - to be cherished / close to the heart
- worn stone casement ledges - classical element that transcends the barriers of time and age
- flight of birds - emphasizing its ability to lift the readers to sublime heights, to emphasize rhythm and harmony
- motionless in time as the moon climbs – understanding of poem subtle and imperceptible (any two)

### Q12. PLAY

**TOTAL-5 MARKS**

**Objectives:** To test the students' ability to comprehend plays, understand character etc.

<b>Marking:</b> Content:	3 marks
Expression:	2 marks

**OPTION (1) AN ADVENTURE STORY**

- Queen Mother to Alexander
- She replies to his question whether he could have contained his ambition at any time in the past. She was aware his ambition was too deep rooted to let him rest in peace.
- Any answer either in favour or against - with evidence

**OR**

**OPTION (2) MONKEY'S PAW**

**Suggested answer**

- No, because Mr. White had been expecting his wish for 200 pounds to be fulfilled
- had been anxious, tense and excited
- had been waiting for something unexpected to happen
- had felt the paw move in his hands
- was fearful / apprehensive about outcome of wish

**OR**

Yes, with a suitable justification

**Q13. FICTION**

**TOTAL 4X2=8 MARKS**

**Objective:** To test students' ability to comprehend, interpret and evaluate prose texts

<b>Marking:</b> Content	-	3 marks
Expression	-	1 mark

- The pain she suffered at the death of her love, Doronin made her identify with the pain and suffering of the characters she portrayed. Acting was no longer mouthing lines but portraying true feelings.
- Not over competitive: child should work for the pleasure of learning and to know how the result of his work benefits society; should nurture independent thinking minds.
- he wanted some private space; had to share room in the house: was a dreamer and was daydreaming in the tree without any interruption

#### Q14. LONG ANSWERS - FICTION

Total 7 marks

**Objectives:** To test students' ability to comprehend prose texts globally, interpret and evaluate them.

**Marking:** Content – 4 marks  
Expression – 3 marks

#### Option -1 JUDGEMENT OF PARIS

**Note:** Marks should be awarded for the students' creativity

#### Suggested Value Points:

- meeting the comedians at the cafe
- asking for help to deal with stage fright
- Robichon's proposal
- accepting his offer both for the money and the publicity
- looking forward to the lecture
- wondering what will happen

#### Option-2 ROOM 10'x 8'

#### Suggested Value Points:

Accept both yes and no for an answer as the question is open ended.

#### Similarities

- Mrs. Malik and daughter-in-law quite similar in their approach to their mothers-in-law
- both insensitive
- both dominating personalities - husbands passive
- both quite modern

#### Differences

- Mrs. Malik
  - very hard working
  - practical - accepts government rent
    - accepts daughter-in-law's position as mistress of the house
- Daughter-in-law
  - fashionable
  - wears loud colours
  - happy to get a house without really working towards its constructions
  - speaks English to exclude mother-in-law from conversation

QUESTION PAPER CODE 212

**EXPECTED ANSWERS/VALUE POINTS**

**SECTION A: (READING) 20 Marks**

**Q1. READING**

**OFF THE BEATEN TRACK**

**TOTAL MARKS: 12**

Under Section A, Reading (Q1) question has been designed to test a student's understanding of the passage and his/her ability to interpret, evaluate and respond to the given passage. As such, content assumes more importance than expression in the answers to these questions. Please do not hesitate to award full marks if the answer deserves it.

**Objective :** To identify and understand main parts of the text.

**Marking :** As marked in the question paper. No penalty for spelling and grammar.

Accept any other word equivalent in meaning to the answers given below.

**Answers: (a)**

- i. journey of life / journey through his school days / long journey from Rameshwaram to his present position 1 mark  
to address / advice the youth  
to know their dreams and motivate them 1 mark
- ii. hard work; ambition; assessing one's self worth by the value of his contribution; self confidence  $\frac{1}{2} \times 4 = 2$  marks
- iii. The belief that one deserves the best / that they must live a good life in a strong and prosperous nation 1 mark
- iv. that abundance and spirituality are mutually exclusive / it is wrong to desire material things 1 mark  
abundance brings with it security and confidence / helps to preserve our freedom 1 mark
- v. whatever one does must come from the heart and express ones's spirit / it's alright to dream of a life of abundance / to work for the golden era / to express your spirit / spread love and joy around you (anyone) 1 mark

**Q1.2 VOCABULARY**

**Objective :** To deduce the opposites of unfamiliar lexical items.

**Marking :** 1 mark each (4 marks)

- Answers :** b) i. enlightened  
ii. abundance / profusion  
ii. appreciate  
iv. asceticism

**Q 2. Note making and Summarizing**

**Total Marks: 8**

**Objective :** To develop the skill of taking down notes

To develop the extracted ideas into a sustained piece of writing.

**Marking : Note making**

**5 marks**

Heading 1 mark

Abbreviations / Symbols 1 mark  
(with or without key)  
(minimum four)

Content 3 marks  
(minimum three sub headings)

**Important instructions:**

The notes provided below are only guidelines. Any other title, main points and sub points should be accepted if they are indicative of the students' understanding of the given passage and the notes include the main points with suitable and recognizable abbreviations.

**Complete sentences should not be accepted as notes. Half a mark should be deducted from the total if the student writes complete sentences.**

**Numbering of points can be indicated in different ways and these should be accepted as long as it follows a consistent pattern.**

**(a) Note making**

**Note: If the student has attempted only the summary or only the notes, due credit should be given**

**Suggested Notes**

**Title: History of Gardens**

**or**

## **Any other suitable title**

### 1. Evolution of Garden

- a. early man went in search of plants
- b. Neolithic period - man started to grow his own food
  - i. first garden - veg. garden

### 2. Early Agriculture

- a. different types of plants grown
  - i. edible
  - ii. ornamental
  - iii. medicinal

### 3. Significance of Gardens

- a. certain plants had rel., spiritual value
  - i. used to honour gods
- b. display of wealth & power
- c. garden as a paradise
  - i. e.g. hanging gardens of Babylon

### 4. Garden Architecture

- a. design & layout of garden became imp.
  - i. symmetrical - trees pruned to fit design
- b. garden - a work of art

## **Key to Abbreviations**

- 1. veg. – vegetable
- 2. eg. – example
- 3. med. – medicine
- 4. rel. – religious

- Note:** 1. Any other suitable abbreviations done by the students may be accepted.  
2. No student to be penalized if they have not given a key to abbreviations separately.

**(b) SUMMARY**

Objective:1)To expand notes ( headings and sub-headings) into a summary

2)To test ability of extraction

Marking: Content 2 marks

Expression 1 mark

**Note:** Considering the numerous facts mentioned in the notes, due consideration should be given to the students if they do not cover all the points in the summary which is expected to be concise. The summary should cover the essential details only.

**SECTION B (WRITING)**

**TOTAL - 25 MARKS**

In Section B, where questions have been designed to test the writing skills of the students, expression (grammatical accuracy, appropriate vocabulary and style, spellings, organization and presentation of relevant matter in a coherent and logical way) is important.

**Q.3. OPTION 1**

**FACTUAL DESCRIPTION**

**TOTAL - 5 MARKS**

**Objective:** Writing a factual description of a place in an appropriate style

**Marking:** 5 Marks

**Note:**

Heading ½ mark

Content 2 ½ marks

**Suggested Value Points**

- size
- location
- description of layout
- arrangement of furniture / decor
- ventilation / view

Expression 2 marks

Coherence and relevance of ideas and style

**Note :** Can be presented as a diary entry. No penalty for format.



## OPTION-2

### POSTER

### WORLD SAVE ENERGY DAY

**TOTAL - 5 MARKS**

**Objective:** To write in an appropriate style of a poster (blurbs, bullets, different font size etc. may be considered)

**Marking:** Content 3 marks  
(to include heading and issuing authority)

#### **Suggested Value points**

- highlight the need to conserve electricity - its merits
- measures to be taken
- appropriate slogans

Expression 2 marks

Coherence and relevance of ideas and style

## Q.4. Option -1

### LETTER TO THE EDITOR - CAREER COUNSELLING

**TOTAL -10 MARKS**

**Objectives:** To use an appropriate style to write a formal letter.  
To plan, organize and present ideas coherently

**Marking:** Format 2 marks

- ( 1. sender's address, 2. date
- 3. address of the addressee
- 4. salutation. 5. subject
- 6. complimentary close
- 7. sender's signature/name)

Content 4 marks

#### **Suggested value points**

- mention of counselling workshops- regular feature
- utility of such workshops
- advantages
- disadvantages (if any)

**Expression:** 4 marks

(Grammatical accuracy, appropriate words and spellings 2 marks

coherence-and relevance of ideas and styler) 2 marks

**Or**

**Option -2**

**LETTER SEEKING INFORMATION - INSTITUTE OF SPACE SCIENCE**

**TOTAL -10 MARKS**

**Objectives:** To use an appropriate style to write a formal letter  
To plan, organize and present ideas coherently

**Marking: Format** **2 marks**

1. sender's address
2. date
3. address of the addressee
4. salutation
5. subject
6. complimentary close
7. sender's signature/name

**Content** **4 marks**

**Suggested value points**

- asking for details of programs offered
- entrance examination (date, time, venue)
- duration of the course
- fee structure
- placement opportunities
- other relevant questions

**Expression** **4 marks**

- Grammatical accuracy, appropriate words and spellings 2 marks
- coherence and relevance of ideas and style 2 marks

**Q.5. Option -1**

**ARTICLE – ROLE OF ENVIRONMENT ON HOLISTIC GROWTH**

**Objective:** To write in a style appropriate to the given situation.  
To plan, organize and present ideas coherently.

**Marking: Format** 1 mark  
(heading and writer's name)

**Content** 4 marks

**Expression** 5 marks

- Grammatical accuracy, appropriate words and spellings 2 ½ marks
- coherence and relevance of ideas and style 2 ½ marks

**Suggested value points**

- importance of favourable environment
- effect on child's potential
- stress free learning leads to maximum output
- leads to healthy competition

**Option - 2**

**SPEECH - COMMERCIAL ADVERTISEMENTS - BOON OR CURSE**

**TOTAL - 10 MARKS**

**Objective:** To write in a style appropriate to the given situation.  
To plan, organize and present ideas coherently.

**Marking: Content** 5 marks  
(to include greeting and thanking)

**Suggested Value points**

**Any view point based on given input**

**Curse**

- attractive advertisements, glorify products
- incomplete information, people duped
- leading to greed/dissatisfaction, if unaffordable

**Boon**

- create awareness
- make it possible to compare products
- improve products/services / quality
- educates society

<b>Expression</b>	5 marks
<ul style="list-style-type: none"> <li>Grammatical accuracy, appropriate words and spellings</li> </ul>	2½ marks
<ul style="list-style-type: none"> <li>coherence and relevance of ideas and style</li> </ul>	2½ marks

### SECTION C (GRAMMAR)

**20 MARKS**

In Section C, care should be taken not to award marks to any inaccurate answer carrying errors in grammar and punctuation.

#### Q6. REARRANGING

**TOTAL: 5 MARKS**

**Objectives:** To read and arrange sentences in a sequential order 5 marks

**Marking:** 1 mark for every correct answer

#### Answer

- Elizabeth Garrett Anderson was born in a rich family, in 1836.
- On growing up, Elizabeth realized that there was only one registered woman doctor in the world - Elizabeth Blackwell.
- When Blackwell visited England she gave a lecture on “Medicine as a profession for ladies.”
- Elizabeth was in the audience and felt inspired.
- She argued with her father that if women could become efficient nurses like Florence Nightingale, why couldn’t they become doctors.

#### Q7. DIALOGUE WRITING

**TOTAL: 5 MARKS**

**Objectives:** To extend the given input into a meaningful dialogue.

**Marking:** ½ mark each for every correct dialogue provided it is accurately and appropriately expressed. No marks should be awarded if there is any inaccuracy. This includes inaccuracies in grammar, spelling or punctuation. 5 marks

#### Sample Answers:

- Mrs. C: Do you at times feel misunderstood?  
 Gayatri: Yes, everywhere, especially at home.
- Mrs. C: Are your parents happy at the number of hours you put in for your studies?  
 Gayatri: No. They feel I am not studying enough.

3. Mrs. C: Do they have any other complaints against you?  
Gayatri: Yes. they do. They often say that I am rude.
4. Mrs. C: What is their view on the way you dress?  
Gayatri: Well, they say that I do not dress appropriately on many occasions.
5. Mrs. C: Do you help your mother in housework?  
Gayatri: I have so much of school work that I have no time to help.
6. Mrs. C: Do you talk too much on the phone?  
Gayatri; There is always so much to catch up on especially if I have been absent for a day from school.

**(Any other suitable exchange may be accepted)**

**Q.8. EDITING**

**TOTAL: 5 MARKS**

**Objectives:** To use grammatical items appropriately

**Marking:** ½ mark each

If the candidate copies the sentence and replaces the incorrect word with the correct answer marks should be awarded. However, if only the correct words are given marks are to be awarded.

	<u>Incorrect</u>	–	<u>Correct</u>
1.	didn't	–	don't
2.	under	–	in/inside/below
3.	has	–	have
	throat	–	throats
4.	a	–	the
	and	–	which
5.	must	–	can
	no error		
	must be	–	is
6.	it	–	them
7.	crush	–	crushed
8.	they	–	it
9.	this	–	which
10.	will	–	can

**Note :**      **Sentence 2 has 3 options as indicated above**  
**Sentence 3 has 2 options as indicated above**  
**Sentence 4 has 2 options as indicated above**  
**Sentence 5 has 3 options as indicated above**

**Q9. FRAMING QUESTIONS**

**TOTAL-5 MARKS**

**Objectives:** To understand the context and frame relevant and appropriate questions.

**Marking:** ½ mark each for every accurate question framed

**Note:** No marks to be awarded if there is any inaccuracy. The ten questions should cover at least any of the two areas specified for the interview in the given question.

**Suggested Answers:**

1. Do you check the material of the clothes that you buy?
2. Do you look at the price before buying clothes?
3. Do you buy branded clothes?
4. Do you give importance to style while buying clothes?
5. Do you give preference to the utility of the clothes that you buy?
6. Do you buy bright coloured clothes?
7. Do you give importance to the design of the clothes?
8. Are you influenced by the choices of your parents and friends?
9. Do you prefer buying clothes from boutiques?
10. Do you mind buying clothes from smaller shops?

**SECTION D: LITERATURE**

**TOTAL -35 MARKS**

Under Section D (Q10) question has been designed to test a student's understanding of the passage and his/her ability to interpret, evaluate and respond to the given passage. As such, content assumes more importance than expression in the answers to these questions. Please do not hesitate to award full marks if the answer deserves it.

**Q10. REFERENCE TO CONTEXT**

**TOTAL- 7 MARKS**

**Objective:** To test students' comprehension of poetry- local, global, interpretative, inferential and evaluative

**Marking:** 7 marks

**Answers:**

**OPTION (1) SURVIVORS**

- a) the poem is about the ravages / after-effects / damage / destruction due to war both in material, physical and psychological terms 1 mark
- b) - the combatants / survivors  
- they dream of their friends who died in the war / the scenes of war  
1 + 1 mark
- c) the non-combatants call war glorious but it shattered the pride of the soldiers  
- so how could it be glorious? 2 marks
- d) - the survivors of the war 1 mark  
- they have been reduced to a helpless state and have to re-learn the basic processes of life 1 mark

**OPTION (2) CURTAIN**

- a) Ironical that murder leads to birth of ghosts / murder can be white - no bloodshed 1 mark  
Kiss leads to separation creating two lonely souls; from one happy soul they have become two suffering individuals 1 mark
- b) It is a speech that one makes to oneself. 'Two' refers to the two lovers who have separated. 1 + 1 mark
- c) The two lovers are the ghosts. 1 mark  
- called Hamlets due to loneliness / no one to share their grief / debating within themselves regarding decision to separate / whether their decision to separate was right. (any two) 1 mark
- d) Two worlds apart tomorrow 1 mark

**Q11. POETRY**

**TOTAL 4X2 = 8 MARKS**

**Objectives:** To test students' comprehension of poetry - local and global

**Marking:** Content: 3 marks

Expression: 1 mark

## SUGGESTED ANSWERS

- a) The first stanza expresses the feeling of joy at the abundance which is a part of autumn such as blooming flowers, ripening fruits and the feeling that the season will never end.

The second stanza describes the harvesting and the collecting of the grains, a slowing down of the pace of things, preparing for winter.

The third stanza mentions the beauty of the dying day and the sounds associated with this season which has a mournful mood-the bleating of the full grown lambs, the wail of the gnats etc.

- b) Love for his mother mixed with regret/remorse/guilt. He remembers her as a young, active, beautifully adorned mother and is shocked to realize how frail and emaciated she has become - a feather of a one time wing - he feels a choking sensation - 'my tongue licks bark' because he realizes she won't be there too long.
- c) His surprise that such a beautiful girl could be born to people from such a humble background (father cabbage net seller and mother makes laces). He walks with her every Sunday when the Sermon is being delivered in the church.

## Q12. DRAMA

**TOTAL-5 MARKS**

**Objectives:** To test the students' ability to comprehend plays, understand character etc.

**Marking:** Content: 3 marks  
Expression: 2 marks

### OPTION (1) AN ADVENTURE STORY

Alexander makes this remark on his death bed. His last act of mercy is not naming a successor.

Ironic because he had been very cruel and merciless in his life and by not naming a successor he was going to leave the people in greater turmoil as it would lead to fights between his generals who would want to occupy the throne.

**OR**



### OPTION (2) THE MONKEY'S PAW

The second wish was to get dead Herbert come back to life because he died in an accident and mother wanted him back alive They could hear a knocking on the door which became increasingly louder and almost broke down their door. This incident disturbed their peace of mind and emphasized their feeling of loss and sorrow.

#### Q13. PROSE

TOTAL 4X2=8 MARKS

**Objective:** To test students' ability to comprehend, interpret and evaluate prose texts

**Marking:** Content - 3 marks  
Expression - 1 mark

- a) They were the officers appointed by Ashoka to ensure that the people followed the rules of Dharma and to ensure no one misused the rules and to protect those who had no family and to see justice was available to every citizen.
- b) It highlights the plight of a cab driver Iona Potapov who wants to share his sorrow at the loss of his son with someone but can't find anyone. He tries talking to people around him but no one is interested and finally he finds solace talking to his horse. It shows how we have lost the ability to sympathize and show compassion to one another.
- c) She feels so because she had always believed that the lady in the sketch had been herself but on the day she finally moves into the house she finds her daughter-in-law standing in the same pose wearing a saree of the same colour. It is then that she realizes that the lady resembled her daughter-in-law more than her. Also all these years she had considered herself the mistress of the house but in reality it was her daughter-in-law who finally became the mistress.

#### Q14. PROSE (LONG ANSWERS)

Total 7 marks

**Objectives:** To test students' ability to comprehend prose texts globally, interpret and evaluate them.

**Marking:** Content - 4 marks  
Expression - 3 marks

#### OPTION (1)

#### CHARACTER SKETCH

**Note:** Marks should be awarded for students' creativity

### **Suggested Value Points:**

#### **Similarity**

- theatre artists / both young actresses

#### **Contrast**

- both as different as chalk from cheese
- Lisa-deep, intense, passionate about her acting and sensitive to the issues around her.
- affected by the suffering of the people and the war
- one-man woman-Doronin love of her life. His death, a traumatic experience.
- Suzanne - frivolous, flirtatious, likes to have admirers, marriage is not a serious issue, makes a game of it.

### **OPTION (2) HUM OF INSECTS**

#### **Suggested Value Points:**

- remembers happy carefree days spent in his garden
- biscuits brought by his aunt
- songs sung by his grandfather
- illusion that everyone who smiles is happy and the beasts of burden are also happy to serve
- illusion that the world existed only as far as the garden gate
- illusion that the happy days would last for ever

# MATHEMATICS

Time allowed : 3 hours

Maximum Marks : 100

## General Instructions:

1. All questions are compulsory.
2. The question paper consists of **29** questions divided into three sections, A, B and C. Section A comprises of **10** questions of one mark each, Section B comprises of **12** questions of **four** marks each and Section C comprises of **7** questions of **six** marks each.
3. All questions in Section A are to be answered in one word, **one** sentence or as per the exact requirement of the question.
4. There is no overall choice. However, internal choice has been provided in **4** questions of **four** marks each and **2** questions of **six** marks each. You have to attempt only **one** of the alternatives in all such questions.
5. Use of calculators is **not** permitted.

## QUESTION PAPER CODE 65/1/1

### SECTION A

Question numbers 1 to 10 carry one mark each.

1. What is the range of the function  $f(x) = \frac{|x-1|}{(x-1)}$  ?
2. What is the principal value of  $\sin^{-1} \left( -\frac{\sqrt{3}}{2} \right)$  ?
3. If  $A = \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix}$ , then for what value of  $\alpha$  is A an identity matrix?
4. What is the value of the determinant  $\begin{vmatrix} 0 & 2 & 0 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{vmatrix}$  ?

5. Evaluate:  $\int \frac{\log x}{x} dx$

6. What is the degree of the following differential equation?

$$5x \left( \frac{dy}{dx} \right)^2 - \frac{d^2y}{dx^2} - 6y = \log x$$

7. Write a vector of magnitude 15 units in the direction of vector

8. Write the vector equation of the following line:

$$\frac{x-5}{3} = \frac{y+4}{7} = \frac{6-z}{2}$$

9. If  $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 3 & 1 \\ 2 & 5 \end{pmatrix} = \begin{pmatrix} 7 & 11 \\ k & 23 \end{pmatrix}$ , then write the value of k.

10. What is the cosine of the angle which the vector  $\sqrt{2} \hat{i} + \hat{j} + \hat{k}$  makes with y-axis?

## SECTION B

Question numbers 11 to 22 carry 4 mark each.

11. On a multiple choice examination with three possible answers (out of which only one is correct) for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing?

12. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are  $(2\vec{a} + \vec{b})$  and  $(\vec{a} - 3\vec{b})$  respectively, externally in the ratio 1:2. Also, show that P is the mid point of the line segment RQ.

13. Find the Cartesian equation of the plane passing through the points A(0, 0, 0) and B(3, -1, 2) and parallel to the line  $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$

14. Using elementary row operations, find the inverse of the following matrix:

$$\begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$$

15. Let  $Z$  be the set of all integers and  $R$  be the relation on  $Z$  defined as  $R = \{ (a, b) : a, b \in Z, \text{ and } (a - b) \text{ is divisible by } 5. \}$  Prove that  $R$  is an equivalence relation.

16. Prove the following:

$$\tan^{-1} \sqrt{x} = \frac{1}{2} \cos^{-1} \left( \frac{1-x}{1+x} \right), x \in (0, 1)$$

**OR**

Prove the following:

$$\cos^{-1} \left( \frac{12}{13} \right) + \sin^{-1} \left( \frac{3}{5} \right) = \sin^{-1} \left( \frac{56}{65} \right)$$

17. Show that the function  $f$  defined as follows, is continuous at  $x = 2$ , but not differentiable thereat:

$$f(x) = \begin{cases} 3x - 2, & 0 < x \leq 1 \\ 2x^2 - x, & 1 < x \leq 2 \\ 5x - 4, & x > 2 \end{cases}$$

**OR**

Find  $\frac{dy}{dx}$ , if  $y = \sin^{-1} \left[ x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2} \right]$

18. Evaluate:  $\int e^x \left( \frac{\sin 4x - 4}{1 - \cos 4x} \right) dx$

**OR**

Evaluate:  $\int \frac{1-x^2}{x(1-2x)} dx$

19. Evaluate:  $\int_{\pi/6}^{\pi/3} \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$

20. Find the points on the curve  $y = x^3$  at which the slope of the tangent is equal to the y-coordinate of the point.

21. Find the general solution of the differential equation

$$x \log x \cdot \frac{dy}{dx} + y = \frac{2}{x} \cdot \log x$$

**OR**

Find the particular solution of the differential equation satisfying the given conditions:

$$\frac{dy}{dx} = y \tan x, \text{ given that } y = 1 \text{ when } x = 0.$$

22. Find the particular solution of the differential equation satisfying the given conditions:

$$x^2 dy + (xy + y^2) dx = 0 ; y = 1 \text{ when } x = 1.$$

### SECTION - C

**Question number 23 to 29 carry 6 marks each.**

23. A small firm manufactures gold rings and chains. The total number of rings and chains manufactured per day is atmost 24. It takes 1 hour to make a ring and 30 minutes to make a chain. The maximum number of hours available per day is 16. If the profit on a ring is Rs. 300 and that on a chain is Rs. 190, find the number of rings and chains that should be manufactured per day, so as to earn the maximum profit. Make it as an L.P.P. and solve it graphically.

24. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn at random and are found to both clubs. Find the probability of the lost card being of clubs.

**OR**

From a lot of 10 bulbs, which includes 3 defectives, a sample of 2 bulbs is drawn at random. Find the probability distribution of the number of defective bulbs.

25. The points A(4, 5, 10), B(2, 3, 4) and C(1, 2, -1) are three vertices of a parallelogram ABCD. Find the vector equations of the sides AB and BC and also find the coordinates of point D.
26. Using integration, find the area of the region bounded by the curve  $x^2 = 4y$  and the line  $x = 4y - 2$ .

**OR**

Evaluate:  $\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx$

27. Show that the right circular cylinder, open at the top, and of given surface area and maximum volume is such that its height is equal to the radius of the base.
28. Find the values of  $x$  for which  $f(x) = [x(x - 2)]^2$  is an increasing function. Also, find the points on the curve, where the tangent is parallel to  $x$ -axis.
29. Using properties of determinants, show the following:

$$\begin{vmatrix} (b+c)^2 & ab & ca \\ ab & (a+c)^2 & bc \\ ac & bc & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$

**QUESTION PAPER CODE 65/1**

**SECTION A**

**Questions number 1 to 10 carry 1 mark each.**

1. If  $f : \mathbb{R} \rightarrow \mathbb{R}$  be defined by  $f(x) = (3 - x^3)^{1/3}$ , then find  $f \circ f(x)$ .
2. Write the principal value of  $\sec^{-1}(-2)$ .
3. What positive value of  $x$  makes the following pair of determinants equal? .

$$\begin{vmatrix} 2x & 3 \\ 5 & x \end{vmatrix}, \begin{vmatrix} 16 & 3 \\ 5 & 2 \end{vmatrix}$$

4. Evaluate:

$$\int \sec^2(7 - 4x) dx$$

5. Write the adjoint of the following matrix:

$$\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$$

6. Write the value of the following integral:

$$\int_{-\pi/2}^{\pi/2} \sin^5 x dx$$

7. A is a square matrix of order 3 and  $|A| = 7$ . Write the value of  $|\text{adj. } A|$ .

8. Write the distance of the following plane from the origin:

$$2x - y + 2z + 1 = 0$$

9. Write a vector of magnitude 9 units in the direction of vector

$$-2\hat{i} + \hat{j} + 2\hat{k}$$

10. Find  $\lambda$  if  $(2\hat{i} + 6\hat{j} + 14\hat{k}) \times (\hat{i} - \lambda\hat{j} + 7\hat{k}) = \vec{0}$ .

## SECTION B

Questions number 11 to 22 carry 4 marks each.

11. A family has 2 children. Find the probability that both are boys, if it is known that

- (i) at least one of the children is a boy,
- (ii) the elder child is a boy.



12. Show that the relation  $S$  in the set  $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$  given by  $S = \{(a, b) : a, b \in \mathbb{Z}, |a - b| \text{ is divisible by } 4\}$  is an equivalence relation. Find the set of all elements related to 1.

13. Prove the following:

$$\tan^{-1} x + \tan^{-1} \left( \frac{2x}{1-x^2} \right) = \tan^{-1} \left( \frac{3x-x^3}{1-3x^2} \right)$$

**OR**

Prove the following:

$$\cos [\tan^{-1} \{ \sin (\cot^{-1} x) \}] = \sqrt{\frac{1+x^2}{2+x^2}}$$

14. Express the following matrix as the sum of a symmetric and a skew symmetric matrix, and verify your result :

$$\begin{pmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{pmatrix}$$

15. If  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ ,  $\vec{b} = 4\hat{i} - 2\hat{j} + 3\hat{k}$  and  $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$ , find a vector of magnitude 6 units which is parallel to the vector  $2\vec{a} - \vec{b} + 3\vec{c}$ .

**OR**

Let  $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$ ,  $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$  and  $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$ . Find a vector  $\vec{d}$  which is perpendicular to both  $\vec{a}$  and  $\vec{b}$  and  $\vec{c} \cdot \vec{d} = 18$ .

16. Find the points on the line  $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$  at a distance of 5 units from the point  $P(1, 3, 3)$ .

**OR**

Find the distance of the point P(6, 5, 9) from the plane determined by the points A(3, -1, 2), B(5, 2, 4) and C(-1, -1, 6).

17. Solve the following differential equation:

$$(x^2 - 1) \frac{dy}{dx} + 2xy = \frac{1}{x^2 - 1}; |x| \neq 1$$

**OR**

Solve the following differential equation:

$$\sqrt{1 + x^2 + y^2 + x^2 y^2} + xy \frac{dy}{dx} = 0$$

18. Show that the differential equation  $(x - y) \frac{dy}{dx} = x + 2y$ , is homogeneous and solve it.

19. Evaluate the following :

$$\int \frac{x + 2}{\sqrt{(x - 2)(x - 3)}} dx$$

20. Evaluate the following :

$$\int_1^2 \frac{5x^2}{x^2 + 4x + 3} dx$$

21. If  $y = e^{a \sin^{-1} x}$ ,  $-1 \leq x \leq 1$ , then show that

$$(1 - x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - a^2 y = 0.$$

22. If  $y = \cos^{-1} \left( \frac{3x + 4\sqrt{1 - x^2}}{5} \right)$ , find  $\frac{dy}{dx}$ .

### SECTION C

Questions number 23 to 29 carry six marks each.

23. Using properties of determinants, prove the following:

$$\begin{vmatrix} x & x^2 & 1 + px^3 \\ y & y^2 & 1 + py^3 \\ z & z^2 & 1 + pz^3 \end{vmatrix} = (1 + pxyz)(x - y)(y - z)(z - x)$$

**OR**

Find the inverse of the following matrix using elementary operations:

$$A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$$

24. A bag contains 4 balls. Two balls are drawn at random, and are found to be white. What is the probability that all balls are white?
25. One kind of cake requires 300 g of flour and 15 g of fat, another kind of cake requires 150 g of flour and 30 g of fat. Find the maximum number of cakes which can be made from 7.5 kg of flour and 600 g of fat, assuming that there is no shortage of the other ingredients used in making the cakes. Make it as an L.P.P. and solve it graphically.
26. Find the coordinates of the foot of the perpendicular and the perpendicular distance of the point P(3, 2, 1) from the plane  $2x - y + z + 1 = 0$ . Find also, the image of the point in the plane.
27. Find the area of the circle  $4x^2 + 4y^2 = 9$  which is interior to the parabola  $x^2 = 4y$ .

**OR**

Using integration, find the area of the triangle ABC, coordinates of whose vertices are A(4, 1), B(6, 6) and C(8, 4).

- 28.** If the length of three sides of a trapezium other than the base is 10 cm each, find the area of the trapezium, when it is maximum.
- 29.** Find the, intervals in which the following function is
- (a) strictly increasing,
  - (b) strictly decreasing.

# Marking Scheme --- Mathematics

## *General Instructions :*

1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the meaning, such answers should be given full weightage.
2. Evaluation is to be done as per instructions provided in the marking scheme. It should not be done according to one's own interpretation or any other consideration — Marking Scheme should be strictly adhered to and religiously followed.
3. Alternative methods are accepted. Proportional marks are to be awarded.
4. In question(s) on differential equations, constant of integration has to be written.
5. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.
6. A full scale of marks - 0 to 100 has to be used. Please do not hesitate to award full marks if the answer deserves it.

QUESTION PAPER CODE 65/1/1

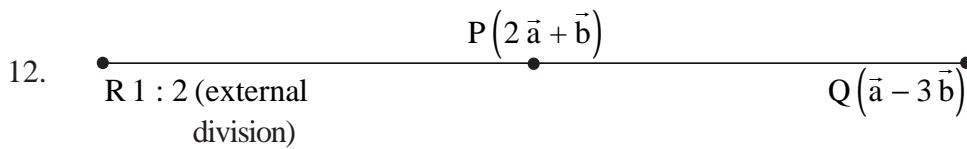
EXPECTED ANSWERS/VALUE POINTS

SECTION - A

1. Range :  $\{-1, 1\}$       2.  $\frac{-\pi}{3}$       3.  $\alpha = 0^\circ$  1×10 m
4. 8      5.  $\frac{1}{2}(\log x)^2 + c$       6. 1
7.  $5\hat{i} - 10\hat{j} + 10\hat{k}$       8.  $\vec{r} = 5\hat{i} - 4\hat{j} + 6\hat{k} + \lambda(3\hat{i} + 7\hat{j} - 2\hat{k})$       9.  $k = 17$
10.  $\frac{1}{2}$

SECTION - B

11. Probability of selecting correct choice =  $\frac{1}{3}$  1m
- Probability of selecting wrong choice =  $\frac{2}{3}$  ½ m
- Probability distribution is given by  $\left(\frac{2}{3} + \frac{1}{3}\right)^5$  1m
- we want to compute P (4 correct answers) } ½ m
- + P (5 correct answers)
- $$= \left(\frac{1}{3}\right)^5 + 5C_4 \left(\frac{1}{3}\right)^4 \left(\frac{2}{3}\right)$$
- $$= \frac{11}{243}$$
- } 1m



Position vector of R is  $\frac{(\vec{a} - 3\vec{b}) \times 1 - (2\vec{a} + \vec{b})(2)}{1 - 2}$  1 m

$= 3\vec{a} + 5\vec{b}$  1 m

Mid - point of RQ is  $\frac{3\vec{a} + 5\vec{b} + \vec{a} - 3\vec{b}}{2}$  1 m

$= 2\vec{a} + \vec{b}$  ½ m

Which is position vector of P ½ m

13. Equation of plane passing through (0,0,0) is

$a(x - 0) + b(y - 0) + c(z - 0) = 0 \Rightarrow \therefore ax + by + cz = 0 \dots\dots\dots(i)$  1 m

It passes through (3, -1, 2)

$\therefore 3a - b + 2c = 0 \dots\dots\dots(ii)$  ½ m

line  $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$  is || to the plane (i)

$\Rightarrow a - 4b + 7c = 0 \dots\dots\dots(iii)$  1 m

From (ii) and (iii),  $a = 1, b = -19$  and  $c = -11$  1 m

Equation of plane is  $x - 19y - 11z = 0$  ½ m

14. Here  $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

Writing  $A = IA \Rightarrow \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} A$  ½ m

Applying  $R_1 \rightarrow R_1 - R_2$ , we get

$$\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} A$$
 1 m

Applying  $R_2 \rightarrow R_2 - R_1$ , we get  $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix} A$  1 m

Applying  $R_1 \rightarrow R_1 - 2R_2$ , we get  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix} A$  1 m

$$\Rightarrow A^{-1} = \begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$$
 ½ m

15.  $R = \{(a, b) : a, b \in Z \text{ and } (a - b) \text{ is divisible by } 5\}$

(i)  $a - a = 0$  which is divisible by 5 }  
 $\therefore R$  is reflexive 1 m

(ii)  $a - b$  is divisible by 5 and so is  $b - a$  }  
 $\therefore R$  is symmetric 1 m

(iii)  $a - c = (a - b) + (b - c)$   
 let  $a - b = 5m$  and  $b - c = 5n$  }  
 $\therefore a - c = 5(m + n) \Rightarrow a - c$  is divisible by 5 1½ m

$\therefore R$  is transitive }  
 $\therefore R$  is an equivalence - relation ½ m



16. Let  $x = \tan^2 \theta \Rightarrow \sqrt{x} = \tan \theta$  1 m

LHS =  $\tan^{-1}(\sqrt{x}) = \tan^{-1}(\tan \theta) = \theta$  1 m

RHS =  $\frac{1}{2} \cos^{-1} \left( \frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} \right) = \frac{1}{2} \cos^{-1} (\cos 2\theta)$  1 m

=  $\frac{1}{2} 2\theta = \theta$  1 m

$\Rightarrow$  LHS = RHS

OR

$\cos^{-1} \frac{12}{13} = \tan^{-1} \frac{5}{12}$  ½ m

$\sin^{-1} \frac{3}{5} = \tan^{-1} \frac{3}{4}$  ½ m

$\sin^{-1} \frac{56}{65} = \tan^{-1} \frac{56}{33}$  1 m

LHS =  $\tan^{-1} \frac{5}{12} + \tan^{-1} \frac{3}{4}$

=  $\tan^{-1} \left[ \frac{\frac{5+9}{12}}{1 - \frac{5}{16}} \right] = \tan^{-1} \left( \frac{\frac{14}{12} \times \frac{16}{11}}{3} \right)$  2 m

=  $\tan^{-1} \frac{56}{33} =$  RHS

17.  $\lim_{h \rightarrow 0} f(2-h) = \lim_{h \rightarrow 0} [2(2-h)^2 - (2-h)] = 6$  .....(i) ½ m

$\lim_{h \rightarrow 0} f(2+h) = \lim_{h \rightarrow 0} [5(2+h) - 4] = 6$  .....(ii) ½ m

$f(2) = 8 - 2 = 6$  .....(iii)

From (i), (ii), and (iii),  $f(x)$  is continuous at  $x = 2$  1 m

$$\text{RHD} = \lim_{h \rightarrow 0} \left[ \frac{\{5(2+h) - 4\} - (6)}{h} \right] \neq \text{LHD} = \lim_{h \rightarrow 0} \left[ \frac{\{(2h-3)(h-2) - 6\}}{-h} \right] \text{ as } 5 \neq 7 \quad \frac{1}{2} + \frac{1}{2} \text{ m}$$

$\therefore f(x)$  is not differentiable there at 1 m

**OR**

$$y = \sin^{-1} \left[ x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2} \right] \dots\dots\dots(i)$$

Let  $x = \sin \alpha$  and  $\sqrt{x} = \sin \theta$  1 m

$\therefore$  (i) becomes  $y = \sin^{-1} [\sin \alpha \cos \theta - \cos \alpha \sin \theta]$   $\frac{1}{2}$  m

$$= \sin^{-1} [\sin(\alpha - \theta)] = \alpha - \theta \quad \frac{1}{2} \text{ m}$$

$$= \sin^{-1} x - \sin^{-1} \sqrt{x} \quad 1 \text{ m}$$

$$\therefore \frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}} - \frac{1}{2\sqrt{x}\sqrt{1-x}} \quad 1 \text{ m}$$

18.  $I = \int e^x \left( \frac{\sin 4x - 4}{1 - \cos 4x} \right) dx$

$$= \int e^x \left[ \frac{\sin 4x}{1 - \cos 4x} - \frac{4}{1 - \cos 4x} \right] dx \quad 1 \text{ m}$$

$$= \int e^x \left[ \frac{2 \sin 2x \cos 2x}{2 \cdot \sin^2 2x} - \frac{4}{2 \sin^2 2x} \right] dx \quad 1 \text{ m}$$

$$= \int e^x [\cot 2x - 2 \operatorname{cosec}^2 2x] dx \quad \frac{1}{2} \text{ m}$$

This is of the form  $= \int e^x [f(x) + f'(x)] dx$   $\frac{1}{2}$  m

$$\therefore I = e^x \cot 2x + c \quad 1 \text{ m}$$

OR

$$I = \int \frac{1-x^2}{x(1-2x)} dx = \frac{1}{2} \int \frac{2-2x^2}{x-2x^2} dx$$
$$= \frac{1}{2} \int \left[ 1 + \frac{2-x}{x(1-2x)} \right] dx \quad 1 \text{ m}$$

$$= \frac{x}{2} + \frac{1}{2} \int \frac{2-x}{x(1-2x)} dx \quad \frac{1}{2} \text{ m}$$

$$\text{Let } \frac{2-x}{x(1-2x)} = \frac{A}{x} + \frac{B}{1-2x} \cdot \text{Getting } A=2, B=3 \quad 1 \text{ m}$$

$$\therefore I = \frac{x}{2} + \frac{1}{2} \int \left( \frac{2}{x} + \frac{3}{1-2x} \right) dx \quad \frac{1}{2} \text{ m}$$

$$= \frac{x}{2} + \log|x| - \frac{3}{4} \log|1-2x| + c \quad 1 \text{ m}$$

19. Let  $\sin x - \cos x = t \Rightarrow (\cos x + \sin x) dx = dt$ , Also,  $\sin 2x = 1 - t^2$  } 1 m

When  $x = \frac{\pi}{3}$ ,  $t = \frac{\sqrt{3}-1}{2}$ , when  $x = \frac{\pi}{6}$ ,  $t = \frac{1-\sqrt{3}}{2}$

$$\therefore \text{ Given integral becomes } I = \int_{\frac{1-\sqrt{3}}{2}}^{\frac{\sqrt{3}-1}{2}} \frac{dt}{\sqrt{1-t^2}} \quad 1 \text{ m}$$

$$= \left[ \sin^{-1} t \right]_{\frac{1-\sqrt{3}}{2}}^{\frac{\sqrt{3}-1}{2}} = \sin^{-1} \left( \frac{\sqrt{3}-1}{2} \right) - \sin^{-1} \left( \frac{1-\sqrt{3}}{2} \right) \quad 2 \text{ m}$$

$$\text{or } 2 \sin^{-1} \left( \frac{\sqrt{3}-1}{2} \right)$$

20. Equation of curve is  $y = x^3 \Rightarrow \frac{dy}{dx} = 3x^2$  .....(i) 1 m

(i) = y – coordinate of the point  $\Rightarrow 3x^2 = y = x^3 \Rightarrow x^2(x - 3) = 0$  }  
 $\Rightarrow x = 0, x = 3$  1 m

When  $x = 0, y = 0$ , when  $x = 3, y = 27$  1 m

The points are (0,0), (3, 27)  $\frac{1}{2} + \frac{1}{2}$  m

21. The given differential equation can be written as

$$\frac{dy}{dx} + \frac{1}{x \log x} y = \frac{2}{x^2}$$
 1/2 m

$$\text{I.F.} = e^{\int \frac{1}{x \log x} dx} = e^{\log(\log x)} = \log x$$
 1 m

The solution is  $y \cdot \log x = \int \frac{2}{x^2} \cdot \log x \, dx + c$  1/2 m

or,  $y \cdot \log x = 2 \left[ \log x \cdot \left( \frac{-1}{x} \right) + \int \frac{dx}{x^2} \right] + c = 2 \left[ \frac{-\log x}{x} - \frac{1}{x} \right] + c$  1 1/2 m

$\Rightarrow y \cdot \log x = -\frac{2}{x} [1 + \log x] + c$  1/2 m

**OR**

Given differential equation can be written as

$$\int \frac{dy}{y} = \int \tan x \, dx$$
 1 m

or,  $\log y = \log \sec x + c$  1 m

when,  $x = 0, y = 1 \Rightarrow c = 0$  }  
 [Note :  $c = 1$ , if constant is taken as  $\log c$ ] 1 m

$\therefore \log y = \log \sec x$  }  
 or  $y = \sec x$  1 m

22. The given differential equation can be written as

$$\frac{dy}{dx} + \frac{xy + y^2}{x^2} = 0 \cdot \text{Let } y = vx \Rightarrow \frac{dy}{dx} = v + x \frac{dv}{dx} \quad 1 \text{ m}$$

$$\Rightarrow v + x \frac{dv}{dx} + (v + v^2) = 0 \quad \left. \vphantom{\frac{dy}{dx}} \right\} \quad 1 + \frac{1}{2} \text{ m}$$

$$\Rightarrow x \frac{dv}{dx} = -v(2+v)$$

$$\text{or } \frac{dv}{v(2+v)} = -\frac{dx}{x}$$

$$\text{or } \int \left( \frac{1}{v} - \frac{1}{2+v} \right) dx = -2 \int \frac{dx}{x} \quad \frac{1}{2} \text{ m}$$

$$\Rightarrow \log \frac{v}{v+2} = \log \frac{c}{x^2}$$

$$\text{or } \frac{y}{y+2x} = \frac{c}{x^2} \quad \frac{1}{2} \text{ m}$$

$$\text{when } x = 1, y = 1 \Rightarrow c = \frac{1}{3}$$

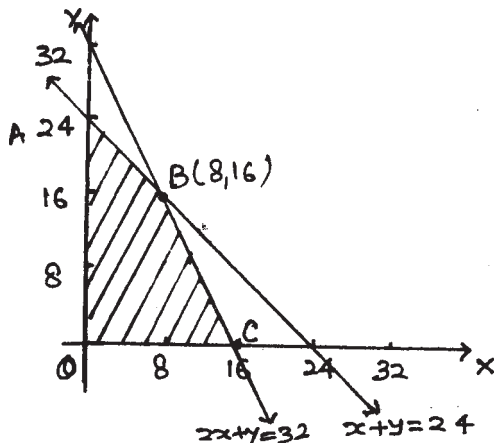
$\therefore$  The solution becomes

$$y + 2x = 3x^2y \quad \frac{1}{2} \text{ m}$$

### SECTION - C

23. Let  $x$  be the number of gold rings and  $y$ , the number of chains

The objective function is  $Z = 300x + 190y$  1 m



Constraints are :

$$\left. \begin{aligned} x + y &\leq 24 \\ 2x + y &\leq 32 \\ x &\geq 0, y \geq 0 \end{aligned} \right\} \quad 2 \text{ m}$$

Correct graph 2 m

Getting corners of feasible region as

A (0, 24), B (8, 16)

C (16, 0), O (0, 0)

$$Z_{(0,0)} = 0, Z_A = 4560, Z_C = 4800$$

$$Z_B = 300 \times 8 + 190 \times 16 = 2400 + 3040 = 5440$$

∴ Z is maximum at B (8, 16)

∴ For maximum profit, Rings = 8, chains = 16

24. Let  $E_1$  be the event that lost card is that of clubs

$E_2$  be event that lost card is not of clubs

A: Two cards of clubs are drawn from remaining cards

$$P(E_1) = \frac{1}{4}, P(E_2) = \frac{3}{4}$$

$$P\left(\frac{A}{E_1}\right) = \frac{{}^{12}C_2 / {}^{51}C_2}{{}^{17}C_2 / {}^{50}C_2} = \frac{12 \times 11}{17 \times 25} = \frac{22}{425}$$

$$P\left(\frac{A}{E_2}\right) = \frac{{}^{13}C_2 / {}^{51}C_2}{{}^{17}C_2 / {}^{50}C_2} = \frac{13 \times 12}{17 \times 25} = \frac{26}{425}$$

$$P\left(\frac{E_1}{A}\right) = \frac{P\left(\frac{A}{E_1}\right) \cdot P(E_1)}{\sum P(E_i) \cdot P\left(\frac{A}{E_i}\right)}$$

$$= \frac{\frac{22}{425} \times \frac{1}{4}}{\frac{22}{425} \times \frac{1}{4} + \frac{26}{425} \times \frac{3}{4}} = \frac{11}{50}$$

**OR**

Let X be the random variate giving number of defective bulbs, X can take values 0, 1, 2 1 m

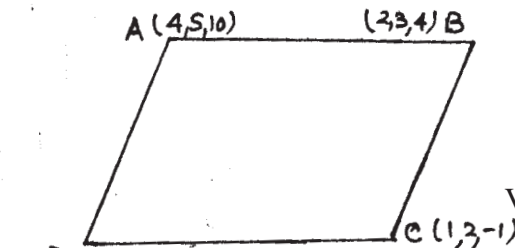
$$P(X=0) = \frac{7c_2}{10c_2} = \frac{7}{15}, \quad P(x=1) = \frac{7c_1 \times 3c_1}{10c_2} = \frac{7}{15}, \quad P(X=2) = \frac{3c_2}{10c_2} = \frac{1}{15} \quad 3 \text{ m}$$

∴ Probability distribution of X is

X	0	1	2
P(X)	$\frac{7}{15}$	$\frac{7}{15}$	$\frac{1}{15}$

2 m

25.



P.V. of A =  $4\hat{i} + 5\hat{j} + 10\hat{k}$

and B =  $2\hat{i} + 3\hat{j} + 4\hat{k}$

Vector equation of AB is

$$\begin{aligned} \vec{r} &= (4\hat{i} + 5\hat{j} + 10\hat{k}) + \lambda \left[ (2\hat{i} + 3\hat{j} + 4\hat{k}) - (4\hat{i} + 5\hat{j} + 10\hat{k}) \right] \\ &= 4\hat{i} + 5\hat{j} + 10\hat{k} + \lambda (-2\hat{i} - 2\hat{j} - 6\hat{k}) \\ \text{or } \vec{r} &= 4\hat{i} + 5\hat{j} + 10\hat{k} + \lambda (\hat{i} + \hat{j} + 3\hat{k}) \end{aligned} \quad \left. \vphantom{\vec{r}} \right\} 1+1 \text{ m}$$

Similarly, vector equation BC is

1½ m

$$\vec{r} = (2\hat{i} + 3\hat{j} + 4\hat{k}) + \mu [-\hat{i} - \hat{j} - 5\hat{k}]$$

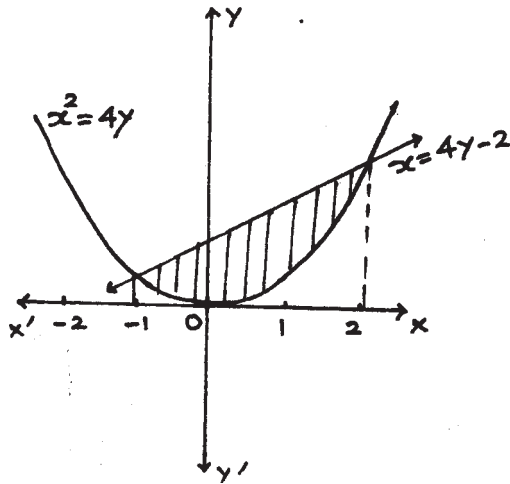
$$\text{or } \vec{r} = 2\hat{i} + 3\hat{j} + 4\hat{k} + \mu (\hat{i} + \hat{j} + 5\hat{k})$$

Mid-point of AC is  $\frac{5}{2}\hat{i} + \frac{7}{2}\hat{j} + \frac{9}{2}\hat{k}$  1 m

Mid-point of BD is  $\frac{x+2}{2}\hat{i} + \frac{3+y}{2}\hat{j} + \frac{4+z}{2}\hat{k}$  1 m

Coordinates of D are (3, 4, 5) ½ m

26.



Correct Figure

1 m

Point of intersection of curve and

line has x coordinates  $x = 2, x = -1$

1 m

Required area =

$$= \int_{-1}^2 \frac{x+2}{4} dx - \int_{-1}^2 \frac{x^2}{4} dx$$

1+1 m

$$= \frac{1}{4} \left[ \frac{x^2}{2} + 2x - \frac{x^3}{3} \right]_{-1}^2$$

1 m

$$= \frac{1}{4} \left[ \left( 2+4-\frac{8}{3} \right) - \left( \frac{1}{2}-2+\frac{1}{3} \right) \right]$$

1 m

$$= \frac{9}{8} \text{ sq. u.}$$

OR

$$= \pi^2 - 2\pi$$

$$I = \int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx \Rightarrow I = \int_0^{\pi} \frac{(\pi-x) \tan x}{\sec x + \tan x} dx$$

1 m

$$2I = \int_0^{\pi} \frac{\pi \tan x}{\sec x + \tan x} dx = \pi \int_0^{\pi} \frac{\sin x}{1 + \sin x} dx$$

½ m

$$= \pi \int_0^{\pi} \left( 1 - \frac{1}{1 + \sin x} \right) dx = \pi \int_0^{\pi} \left( 1 - \frac{1 - \sin x}{\cos^2 x} \right) dx$$

2 m

$$= \pi \int_0^{\pi} (1 - \sec^2 x + \sec x \tan x) dx$$

1 m

$$= \pi [x - \tan x + \sec x]_0^{\pi} = \pi [\pi - 1 - 1]$$

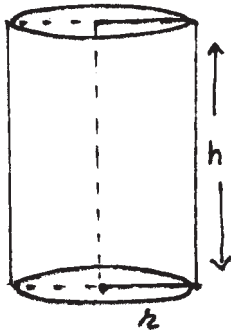
1 m

$$\therefore I = \frac{\pi^2}{2} - \pi = \frac{\pi}{2} [\pi - 2]$$

½ m



27.



Let  $r$  be the radius of base of cylinder and  $h$ , be

its height which is open at the top 1 m

$$s = \text{Surface area} = 2\pi r h + \pi r^2$$

$$\text{or } \frac{s - \pi r^2}{2\pi r} = h \quad \text{1 m}$$

$$V = \text{Volume of cylinder} = \pi r^2 h$$

$$= \pi r^2 \left( \frac{s - \pi r^2}{2\pi r} \right) = \frac{r}{2} (s - \pi r^2)$$

$$= \frac{rs}{2} - \frac{\pi}{2} r^3 \quad \text{1½ m}$$

$$\frac{dv}{dr} = \frac{s}{2} - \frac{\pi}{2} \cdot 3r^2$$

$$\frac{dv}{dr} = 0 \Rightarrow s = 3\pi r^2 = 2\pi r h + \pi r^2$$

$$\Rightarrow 2\pi r \cdot r = 2\pi r h \Rightarrow r = h \quad \text{1½ m}$$

$$\frac{d^2v}{dr^2} < 0 \Rightarrow \text{Volume is maximum at } r = h$$

$\therefore$  Radius of base of cylinder = its Height

} ½ + ½ m

28.  $f(x) = [x(x-2)]^2$

$$f'(x) = 4x(x-2)(x-1)$$

$$f'(x) = 0 \text{ gives } x = 0, x = 1 \text{ or } x = 2$$

$\therefore$  Intervals are  $(-\infty, 0), (0, 1), (1, 2), (2, \infty)$  } 1½ m

Increasing in  $[0, 1]$  and  $[2, \infty)$

$$\Rightarrow \text{or } 0 \leq x \leq 1 \text{ and } x \geq 2 \quad \text{1½ m}$$

The point where tangents are parallel to  $x$  axis

are  $(0, 0), (1, 1), (2, 0)$  1 m

$$29. \quad \Delta = \begin{vmatrix} (b+c)^2 & b a & c a \\ a b & (c+a)^2 & b c \\ a c & b c & (a+b)^2 \end{vmatrix}; \quad \begin{array}{l} \text{Applying } R_1 \rightarrow a R_1 \\ R_2 \rightarrow b R_2, R_3 \rightarrow c R_3 \\ \text{we get} \end{array}$$

$$= \frac{1}{a b c} \begin{vmatrix} a(b+c)^2 & b a^2 & c a^2 \\ a b^2 & b(c+a)^2 & c b^2 \\ a c^2 & b c^2 & c(a+b)^2 \end{vmatrix} \quad 1 \text{ m}$$

$$= \begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} \quad \frac{1}{2} \text{ m}$$

Applying  $C_1 \rightarrow C_1 - C_3, C_2 \rightarrow C_2 - C_3$ , we get

$$\Delta = \begin{vmatrix} (b+c)^2 - a^2 & 0 & a^2 \\ 0 & (c+a)^2 - b^2 & b^2 \\ c^2 - (a+b)^2 & c^2 - (a+b)^2 & (a+b)^2 \end{vmatrix} \quad 1 \text{ m}$$

$$= (a+b+c)^2 \begin{vmatrix} b+c-a & 0 & a^2 \\ 0 & c+a-b & b^2 \\ c-a-b & c-a-b & (a+b)^2 \end{vmatrix} \quad \frac{1}{2} \text{ m}$$

Applying  $R_3 \rightarrow R_3 - (R_1 + R_2)$ , we get

$$\Delta = (a+b+c)^2 \begin{vmatrix} b+c-a & 0 & a^2 \\ 0 & c+a-b & b^2 \\ -2b & -2a & 2ab \end{vmatrix} \quad 1 \text{ m}$$

Applying  $C_1 \rightarrow aC_1$  and  $C_2 \rightarrow bC_2$  we get

$$\Delta = \frac{(a+b+c)^2}{ab} \begin{vmatrix} ab+ac-a^2 & 0 & a^2 \\ 0 & b(c+a-b) & b^2 \\ -2ba & -2ab & 2ab \end{vmatrix} \quad \frac{1}{2}m$$

Applying  $C_1 \rightarrow C_1 + C_3$ ,  $C_2 \rightarrow C_2 + C_3$  we get

$$\Delta = \frac{(a+b+c)^2}{ab} \begin{vmatrix} a(b+c) & a^2 & a^2 \\ b^2 & b(a+c) & b^2 \\ 0 & 0 & 2ab \end{vmatrix} \quad \frac{1}{2}m$$

$$= \frac{(a+b+c)^2}{ab} \times ab \times 2ab \begin{vmatrix} b+c & a & a \\ b & c+a & b \\ 0 & 0 & 1 \end{vmatrix} \quad \frac{1}{2}m$$

$$= 2ab(a+b+c)^2 [(b+c)(c+a) - ab]$$

$$= 2ab(a+b+c)^2 [bc + c^2 + ab + ac - ab]$$

$$= 2abc(a+b+c)^3 \quad \frac{1}{2}m$$

QUESTION PAPER CODE 65/1

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Marks

1-10. 1.  $x$    2.  $\frac{2\pi}{3}$    3.  $x=4$    4.  $-\frac{1}{4}\tan(7-4x)+c$    5.  $\begin{pmatrix} 3 & 1 \\ -4 & 2 \end{pmatrix}$

1x10 = 10 m

6. zero   7. 49   8.  $\frac{1}{3}$    9.  $-6\hat{i} + 3\hat{j} + 6\hat{k}$    10. -3

SECTION - B

11. Let event A is that the family has two boys

(i) event B: At least one is a boy

$P(\text{both boys, given that at least one is a boy}) = P(A/B)$  1/2 m

$$= \frac{P(A \cap B)}{P(B)} = \frac{P\{(B, B)\}}{P\{(B, G), (G, B), (B, B)\}}$$
 1/2 + 1/2 m

$$= \frac{1/4}{3/4} = \frac{1}{3}$$
 1/2 m

(ii) event C: the elder child is a boy

$P(\text{both boys, given that at elder child is a boy}) = P(A/C)$

$$= \frac{P(A \cap C)}{P(C)} = \frac{P\{(B, B)\}}{P\{(B, G), (B, B)\}}$$
 1 m

$$= \frac{1/4}{2/4} = \frac{1}{2}$$
 1 m

12. (i) For all  $a \in A$ ,  $(a, a) \in S$  ( $\because a - a = 0$  is divisible by 4)

$\therefore S$  is reflexive in  $A$  1 m

(ii) For all  $a, b \in A$ , if  $(a, b) \in S$  then  $|a-b|$  is divisible by 4.

Hence  $|b-a|$  is also divisible by 4  $\Rightarrow S$  is symmetric in  $A$  1 m

(iii)  $\forall a, b, c \in A$ , Let  $(a, b) \in S$  and  $(b, c) \in S$

i.e.  $|a-b|$  is divisible by 4 and  $|b-c|$  is divisible by 4

$\Rightarrow (a-b) = \pm 4p$ ,  $(b-c) = \pm 4q$ , adding to get  $a-c = 4m \Rightarrow (a, c) \in S$  1½ m

$\Rightarrow S$  is transitive in  $A$

Hence  $S$  is an equivalence relation

Elements related to 1 are  $\{1, 5, 9\}$  ½ m

13. LHS =  $\tan^{-1} \left[ \frac{x + \frac{2x}{1-x^2}}{1 - x \frac{2x}{1-x^2}} \right]$  2 m

=  $\tan^{-1} \left[ \frac{x(1-x^2) + 2x}{1-x^2 - 2x^2} \right]$  1 m

=  $\tan^{-1} \left[ \frac{3x - x^3}{1-3x^2} \right] = \text{RHS.}$  1 m

**OR**

LHS =  $\cos [\tan^{-1} \{ \sin (\cot^{-1} x) \}]$

=  $\cos \left[ \tan^{-1} \left\{ \sin \left( \sin^{-1} \frac{1}{\sqrt{1+x^2}} \right) \right\} \right]$  1 m

=  $\cos \left[ \tan^{-1} \left( \frac{1}{\sqrt{1+x^2}} \right) \right] = \cos \left[ \cos^{-1} \frac{\sqrt{1+x^2}}{\sqrt{2+x^2}} \right]$  1+1 m

=  $\frac{\sqrt{1+x^2}}{\sqrt{2+x^2}} = \text{R.H.S}$  1 m

$$14. \quad A = \begin{pmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{pmatrix}, \text{ then } A' = \begin{pmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{pmatrix} \quad 1 \text{ m}$$

$$\text{Writing } A = \frac{1}{2}(A+A') + \frac{1}{2}(A-A') \quad \frac{1}{2} \text{ m}$$

$$\frac{1}{2}(A+A') = \begin{pmatrix} 3 & 1/2 & -5/2 \\ 1/2 & -2 & -2 \\ -5/2 & -2 & 2 \end{pmatrix} \quad \frac{1}{2} \text{ m}$$

$$\frac{1}{2}(A-A') = \begin{pmatrix} 0 & -5/2 & -3/2 \\ 5/2 & 0 & -3 \\ 3/2 & 3 & 0 \end{pmatrix} \quad \frac{1}{2} \text{ m}$$

$$\text{and } \begin{pmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{pmatrix} = \begin{pmatrix} 3 & 1/2 & -5/2 \\ 1/2 & -2 & -2 \\ -5/2 & -2 & 2 \end{pmatrix} + \begin{pmatrix} 0 & -5/2 & -3/2 \\ 5/2 & 0 & -3 \\ 3/2 & 3 & 0 \end{pmatrix} \quad 1 \text{ m}$$

Thus  $A = B + C$

Where B is Symmetric matrix and C is skew symmetric matrix 1/2 m

$$15. \quad 2\vec{a}-\vec{b}+3\vec{c} = (2\hat{i}+2\hat{j}+2\hat{k}) - (4\hat{i}-2\hat{j}+3\hat{k}) + (3\hat{i}-6\hat{j}+3\hat{k}) = \hat{i}-2\hat{j}+2\hat{k} \quad 2 \text{ m}$$

$$|2\vec{a}-\vec{b}+3\vec{c}| = 3 \quad 1 \text{ m}$$

$$\therefore \text{ Required vector} = 2\hat{i}-4\hat{j}+4\hat{k} \quad 1 \text{ m}$$

**OR**

A vector perpendicular to  $\vec{a}$  and  $\vec{b} = \vec{a} \times \vec{b} = 32\hat{i} - \hat{j} - 14\hat{k}$  ½+1 m

Let  $\vec{d} = \lambda (32\hat{i} - \hat{j} - 14\hat{k})$  ½ m

$\therefore \vec{c} \cdot \vec{d} = 18 \Rightarrow \lambda (64+1-56) = 18 \Rightarrow \lambda = 2$  1½ m

$\therefore \vec{d} = 64\hat{i} - 2\hat{j} - 28\hat{k}$  ½ m

16. Any point Q on the given line is Q  $(3\lambda - 2, 2\lambda - 1, 2\lambda + 3)$  1 m

$PQ^2 = (3\lambda - 3)^2 + (2\lambda - 4)^2 + (2\lambda)^2 = 17\lambda^2 - 18\lambda - 16\lambda + 25$  1 m

$PQ^2 = (5)^2 \Rightarrow 17\lambda(\lambda - 2) = 0 \Rightarrow \lambda = 0$  or  $\lambda = 2$  1 m

$\therefore$  The points are Q  $(-2, -1, 3)$  and R  $(4, 3, 7)$  ½+½ m

OR

Normal to the plane passing through A, B and C

is  $\vec{AB} \times \vec{BC} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 2 \\ -6 & -3 & 2 \end{vmatrix} = 12\hat{i} - 16\hat{j} + 12\hat{k}$  or  $3\hat{i} - 4\hat{j} + 3\hat{k}$  1½ m

$\therefore$  Equation of plane is  $\vec{r} \cdot (3\hat{i} - 4\hat{j} + 3\hat{k}) = 19$  or  $3x - 4y + 3z - 19 = 0$  1½ m

Distance of P(6, 5, 9) from the plane =  $\frac{|18 - 20 + 27 - 19|}{\sqrt{(3)^2 + (-4)^2 + (3)^2}}$   
 $= \frac{6}{\sqrt{34}}$  1 m

17. Given differential equation can be written as

$\frac{dy}{dx} + \frac{2x}{x^2-1} \cdot y = \frac{1}{(x^2-1)^2}$  1 m

Which is of the form  $\frac{dy}{dx} + P(x) \cdot y = Q(x)$

$$\int P(x) dx = \int \frac{2x}{x^2-1} dx = \log |x^2-1| \quad \frac{1}{2} \text{ m}$$

$\therefore$  Integrating factor =  $e^{\int P(x) dx} = (x^2-1)$  1 m

$\therefore$  The solution is  $(x^2-1) \cdot y = \int \frac{1}{(x^2-1)^2} (x^2-1) dx$  1 m

$$(x^2-1) \cdot y = \frac{1}{2} \log \left| \frac{x-1}{x+1} \right| + c \quad \frac{1}{2} \text{ m}$$

**OR**

Given differential equation can be written as

$$\sqrt{(1+x^2)} \cdot \sqrt{(1+y^2)} + xy \frac{dy}{dx} = 0 \quad \frac{1}{2} \text{ m}$$

$$\Rightarrow \frac{y}{\sqrt{1+y^2}} dy = -\frac{\sqrt{1+x^2}}{x} dx \quad \frac{1}{2} \text{ m}$$

Integrating both sides, we get

$$\sqrt{1+y^2} = -\int \frac{\sqrt{1+x^2}}{x^2} \cdot x dx = -\int \frac{t^2 dt}{t^2-1} \text{ where } (1+x^2)=t^2 \quad 1 \text{ m}$$

$$\Rightarrow \sqrt{1+y^2} = -\int \left(1 + \frac{1}{t^2-1}\right) dt = -t - \frac{1}{2} \log \frac{t-1}{t+1} + c$$

$$= -\sqrt{1+x^2} - \frac{1}{2} \log \left| \frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1} \right| + c \quad \left. \vphantom{\frac{1}{2} \log} \right\} 1+1 \text{ m}$$

$$\text{or } \sqrt{1+y^2} + \sqrt{1+x^2} + \frac{1}{2} \log \left| \frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1} \right| = c$$



18. Given differential equation can be written as

$$\frac{dy}{dx} = \frac{x+2y}{x-y} = \frac{1+2\frac{y}{x}}{1-\frac{y}{x}} = f\left(\frac{y}{x}\right)$$

hence, the differential equation is homogeneous. 1 m

Taking  $\frac{y}{x} = v$  or  $y = vx \Rightarrow \frac{dy}{dx} = v + x \frac{dv}{dx}$  ½ m

$$\therefore v + x \frac{dv}{dx} = \frac{1+2v}{1-v} \text{ or } x \frac{dv}{dx} = \frac{1+2v}{1-v} - v = \frac{1+v+v^2}{1-v}$$

$$\Rightarrow \int \frac{v-1}{v^2+v+1} dv = - \int \frac{dx}{x} \quad \text{1 m}$$

$$\Rightarrow \frac{1}{2} \int \frac{2v+1-3}{v^2+v+1} dv = -\log|x| + c$$

$$\text{or } \frac{1}{2} \log|v^2+v+1| - \frac{3}{2} \int \frac{dv}{\left(v+\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2} = -\log|x| + c$$

$$\Rightarrow \log|v^2+v+1| + \log x^2 = 2\sqrt{3} \tan^{-1}\left(\frac{2v+1}{\sqrt{3}}\right) + c \quad \text{1 m}$$

$$\Rightarrow \log|y^2+xy+x^2| = 2\sqrt{3} \tan^{-1}\left(\frac{2y+x}{\sqrt{3}x}\right) + c \quad \text{½ m}$$

19. Here  $I = \int \frac{x+2}{\sqrt{x^2-5x+6}} dx = \frac{1}{2} \int \frac{2x-5+9}{\sqrt{x^2-5x+6}} dx$  1 m

$$= \frac{1}{2} \int \frac{2x-5}{\sqrt{x^2-5x+6}} dx + \frac{9}{2} \int \frac{1}{\sqrt{\left(x-\frac{5}{2}\right)^2 - \left(\frac{1}{2}\right)^2}} dx \quad \text{1 m}$$

$$= \sqrt{x^2-5x+6} + \frac{9}{2} \log \left| \left(x-\frac{5}{2}\right) + \sqrt{x^2-5x+6} \right| + c \quad \text{1+1 m}$$

20.  $I = \int_1^2 \frac{5x^2}{x^2+4x+3} dx = 5 \int_1^2 1 - \frac{4x+3}{x^2+4x+3} dx$  1 m

$= 5[x]_1^2 - 10 \int_1^2 \frac{2x+4-\frac{5}{2}}{x^2+4x+3} dx$  ½ m

$= 5 - 10 \left[ \log |x^2+4x+3| \right]_1^2 + 25 \int_1^2 \frac{1}{(x+2)^2 - (1)^2} dx$  1 m

$= 5 - 10 \log \frac{15}{8} + 25 \cdot \frac{1}{2} \left[ \log \left| \frac{x+2-1}{x+2+1} \right| \right]_1^2$  1 m

$= 5 - 10 \log \frac{15}{8} + \frac{25}{2} \log \frac{6}{5}$  ½ m

Note: If solved using partial fractions, the answer be of the fo

$$5 + \frac{5}{2} \log \frac{3}{2} - \frac{45}{2} \log \left( \frac{5}{4} \right)$$

21.  $\frac{dy}{dx} = e^{a \sin^{-1}x} \frac{a}{\sqrt{1-x^2}} = \frac{ay}{\sqrt{1-x^2}}$  1 m

$\Rightarrow \sqrt{1-x^2} \cdot \frac{dy}{dx} = ay \dots\dots\dots (i)$  ½ m

$\Rightarrow \sqrt{1-x^2} \cdot \frac{d^2y}{dx^2} - \frac{x}{\sqrt{1-x^2}} \cdot \frac{dy}{dx} = a \frac{dy}{dx}$  1 m

$\Rightarrow (1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - a\sqrt{1-x^2} \frac{dy}{dx} = 0$  ½ m

$\Rightarrow (1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - a^2y = 0$  [Using (i)] 1 m

$$\begin{aligned}
22. \quad y &= \cos^{-1} \left[ \frac{3}{5}x + \frac{4}{5}\sqrt{1-x^2} \right] \\
&= \cos^{-1} \left[ \frac{3}{5} \cos\theta + \frac{4}{5} \sin\theta \right] \text{ where } x = \cos\theta && 1 \text{ m} \\
&= \cos^{-1} [\cos\alpha \cdot \cos\theta + \sin\alpha \cdot \sin\theta], \because \text{if } \frac{3}{5} = \cos\alpha, \text{ then } \frac{4}{5} = \sin\alpha && 1 \text{ m} \\
&= \cos^{-1} [\cos(\alpha-\theta)] = \alpha-\theta = \cos^{-1} \left( \frac{3}{5} \right) - \cos^{-1}x && 1 \text{ m} \\
\Rightarrow \frac{dy}{dx} &= \frac{1}{\sqrt{1-x^2}} \left[ \text{Note: Answer can also be } -\frac{1}{\sqrt{1-x^2}} \right] && 1 \text{ m}
\end{aligned}$$

### SECTION - C

$$\begin{aligned}
23. \quad \text{LHS} &= \begin{vmatrix} x & x^2 & 1+px^3 \\ y & y^2 & 1+py^3 \\ z & z^2 & 1+pz^3 \end{vmatrix} = \begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} + p \begin{vmatrix} x & x^2 & x^3 \\ y & y^2 & y^3 \\ z & z^2 & z^3 \end{vmatrix} && 1 \text{ m} \\
&= \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} + pxyz \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} && \frac{1}{2} \text{ m} \\
&= (1+pxyz) \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} && \frac{1}{2} \text{ m} \\
&= (1+pxyz) \begin{vmatrix} 1 & x & x^2 \\ 0 & y-x & y^2-x^2 \\ 0 & z-x & z^2-x^2 \end{vmatrix} \begin{matrix} R_2 \rightarrow R_2 - R_1 \\ R_3 \rightarrow R_3 - R_1 \end{matrix} && 1 \text{ m}
\end{aligned}$$

$$= (1+pxyz) (x-y) (z-x) \begin{vmatrix} 1 & x & x^2 \\ 0 & -1 & -(x+y) \\ 0 & 1 & z+x \end{vmatrix} \quad \frac{1}{2} \text{ m}$$

$$= (1+pxyz) (x-y) (z-x) \begin{vmatrix} 1 & x & x^2 \\ 0 & 0 & z-y \\ 0 & 1 & z+x \end{vmatrix} \quad R_2 \rightarrow R_2 + R_3 \quad 1 \text{ m}$$

$$= (1+pxyz) (x-y) (y-z) (z-x) \begin{vmatrix} 1 & x & x^2 \\ 0 & 0 & -1 \\ 0 & 1 & z+x \end{vmatrix} \quad \frac{1}{2} \text{ m}$$

$$= (1+pxyz) (x-y) (y-z) (z-x) \cdot 1 = \text{R.H.S.} \quad 1 \text{ m}$$

**OR**

$$\text{Writing } \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \text{ A} \quad 1 \text{ m}$$

$$R_2 \rightarrow R_2 + R_1 \Rightarrow \begin{pmatrix} 1 & 2 & -2 \\ 0 & 5 & -2 \\ 0 & -2 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \text{ A} \quad 1 \text{ m}$$

$$R_2 \rightarrow R_2 + 2R_3 \Rightarrow \begin{pmatrix} 1 & 2 & -2 \\ 0 & 1 & 0 \\ 0 & -2 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 2 \\ 0 & 0 & 1 \end{pmatrix} \text{ A} \quad 1 \text{ m}$$

$$R_3 \rightarrow R_3 + 2R_2 \Rightarrow \begin{pmatrix} 1 & 2 & -2 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix} \text{ A} \quad 1 \text{ m}$$

$$R_1 \rightarrow R_1 + 2R_3 \Rightarrow \begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 5 & 4 & 10 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix} A \quad \frac{1}{2} \text{ m}$$

$$R_1 \rightarrow R_1 - 2R_2 \Rightarrow \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix} A \quad \frac{1}{2} \text{ m}$$

$$\text{Hence } A^{-1} = \begin{pmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix} \quad 1 \text{ m}$$

24.  $E_1$ : Bag contains 2 white balls and 2 non whites

$E_2$ : Bag contains 3 white balls and 1 non whites 1 m

$E_3$ : Bag contains 4 white balls

A: Getting two white balls

$$P(E_1) = \frac{1}{3}, P(E_2) = \frac{1}{3}, P(E_3) = \frac{1}{3} \quad \frac{1}{2} \text{ m}$$

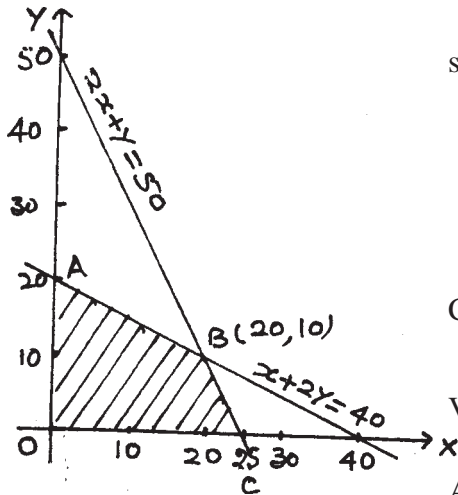
$$P(A/E_1) = \frac{2c_2}{4c_2} = \frac{1}{6}, P(A/E_2) = \frac{3c_2}{4c_2} = \frac{1}{2}, P(A/E_3) = 1 \quad 1\frac{1}{2} \text{ m}$$

$$P(E_3/A) = \frac{P(E_3) \cdot P(A/E_3)}{P(E_1) P(A/E_1) + P(E_2) P(A/E_2) + P(E_3) P(A/E_3)} \quad 1 \text{ m}$$

$$= \frac{\frac{1}{3} \cdot 1}{\frac{1}{3} \cdot \frac{1}{6} + \frac{1}{3} \cdot \frac{1}{2} + \frac{1}{3} \cdot 1} \quad 1 \text{ m}$$

$$= \frac{6}{10} = \frac{3}{5} \quad 1 \text{ m}$$

25. Let  $x$  cakes of first type and  $y$  cakes of second type are made



Maximise  $S = x + y$  1 m

subject to  $300x + 150y \leq 7500$  or  $2x + y \leq 50$

$15x + 30y \leq 600$  or  $x + 2y \leq 40$  2 m

$x \geq 0, y \geq 0$

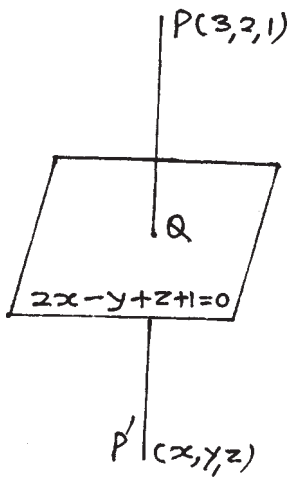
Correct graph 2 m

Vertices of feasible region are

A (0, 20), B (20, 10) C (25, 0)

Maximum cakes =  $20 + 10 = 30$  1 m

26. Let Q be the foot of perpendicular from P to the plane



$\therefore$  Equation of PQ is  $\frac{x-3}{2} = \frac{y-2}{-1} = \frac{z-1}{1}$  1 m

Any point on this line is  $(2\lambda + 3, -\lambda + 2, \lambda + 1)$   $\frac{1}{2}$  m

If this point is Q, then it must satisfy the equation of plane

$\therefore 2(2\lambda + 3) - (-\lambda + 2) + (\lambda + 1) + 1 = 0$  1 m

$\Rightarrow \lambda = -1$   $\frac{1}{2}$  m

$\therefore$  coordinates of foot of perpendicular are Q (1, 3, 0) 1 m

Perpendicular distance =  $PQ = \sqrt{4+1+1} = \sqrt{6}$  units 1 m

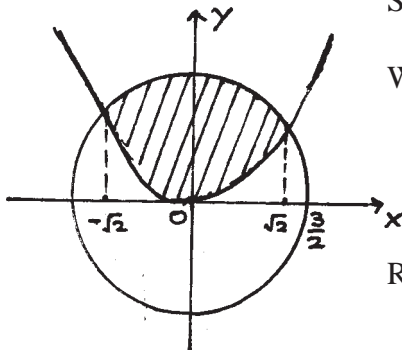
Let  $P'(x, y, z)$  be the image, then  $\frac{x+3}{2} = 1, \frac{y+2}{2} = 3, \frac{z+1}{2} = 0$

$\therefore P'$  is  $(-1, 4, -1)$  1 m

27.

Correct Figure

1 m



Solving  $4x^2 + 4y^2 = 9$  and  $x^2 = 4y$

We get  $x = \pm \sqrt{4y}$  (as points of intersection)

$$\text{or } y = \frac{1}{4}x^2$$

1/2 m

Required area

$$= 2 \left[ \int_0^{\sqrt{2}} \sqrt{\frac{9}{4} - x^2} dx - \int_0^{\sqrt{2}} \frac{1}{4}x^2 dx \right]$$

2 m

$$= 2 \left[ \frac{x}{2} \sqrt{\frac{9}{4} - x^2} + \frac{9}{8} \sin^{-1} \frac{2x}{3} - \frac{x^3}{12} \right]_0^{\sqrt{2}}$$

1 1/2 m

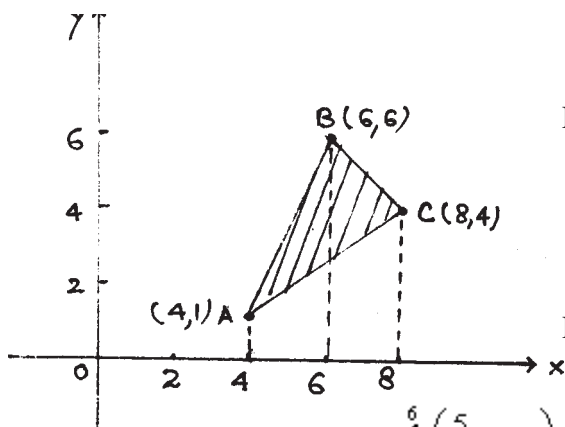
$$= 2 \left( \frac{\sqrt{2}}{2} \cdot \frac{1}{2} + \frac{9}{8} \sin^{-1} \frac{2\sqrt{2}}{3} - \frac{2\sqrt{2}}{12} \right)$$

1/2 m

$$= \left( \frac{\sqrt{2}}{6} + \frac{9}{4} \sin^{-1} \frac{2\sqrt{2}}{3} \right) \text{sq. units}$$

1/2 m

OR



Equations of AB, BC and AC respectively are

$$y = \frac{5}{2}x - 9, \quad y = 12 - x, \quad y = \frac{3}{4}x - 2$$

1 1/2 m

Required area

$$= \int_4^6 \left( \frac{5}{2}x - 9 \right) dx + \int_6^8 (12 - x) dx - \int_4^8 \left( \frac{3}{4}x - 2 \right) dx$$

2 m

$$= \left[ \frac{5x^2}{4} - 9x \right]_4^6 + \left[ 12x - \frac{x^2}{2} \right]_6^8 - \left[ \frac{3x^2}{8} - 2x \right]_4^8$$

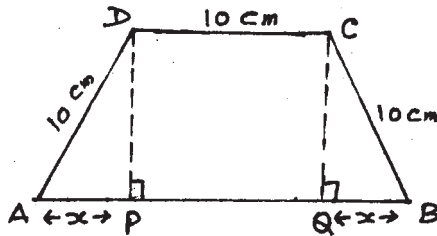
1 1/2 m

$$= (7 + 10 - 10) \text{ sq units}$$

1 m

$$= 7 \text{ sq units}$$

28.



Let ABCD be the given trapezium  
with  $AD = DC = BC = 10 \text{ cm}$ .

Draw  $DP \perp AB$  and  $CQ \perp AB$   
and let  $AP = x \text{ cm} \Rightarrow QB = x \text{ cm}$

1 m

$$\text{Area of trapezium, } A = \frac{1}{2} [10 + (10 + 2x)] \sqrt{100 - x^2}$$

1 m

$$A = (x + 10) \sqrt{100 - x^2}$$

$$\text{Let } S = (x + 10)^2 \cdot (100 - x^2) \Rightarrow \frac{ds}{dx} = -2x(x + 10)^2 + 2(x + 10)(100 - x^2)$$

$$= 2(x + 10)^2 \cdot (-x + 10 - x)$$

1 m

$$= 2(x + 10)^2 \cdot (10 - 2x)$$

$$\frac{ds}{dx} = 0 \Rightarrow x = 5 \text{ [rejecting } x = -10]$$

1 m

$$\frac{d^2s}{dx^2} = -4(x + 10)^2 + 4(x + 10)(10 - 2x) = -900 \text{ (-ve)}$$

1 m

$$\therefore \text{ Maximum Area } A = 15\sqrt{75} \text{ cm}^2 \text{ or } 75\sqrt{3} \text{ cm}^2$$

1 m

29. Full marks to be given to every candidate for this question.

6 m



# PHYSICS (Theory)

*Time allowed : 3 hours*

*Maximum Marks : 70*

## General Instructions:

- (i) All questions are compulsory.
- (ii) There are 30 questions in total. Questions 1 to 8 carry one mark each, questions 9 to 18 carry two marks each, questions 19 to 27 carry three marks each and questions 28 to 30 carry five marks each.
- (iii) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choice in such questions.
- (iv) Use of calculators is **not** permitted.
- (v) You may use the following values of physical constants wherever necessary:

$$c = 3 \times 10^8 \text{ ms}^{-1}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$e = 1.602 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$$

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2\text{C}^{-2}$$

$$\text{Mass of electron } m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{Mass of neutron } m_n = 1.675 \times 10^{-27} \text{ kg}$$

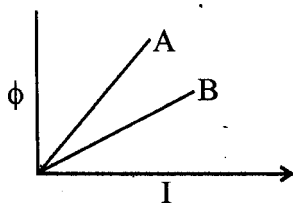
$$\text{Boltzmann's constant } k = 1.381 \times 10^{-23} \text{ JK}^{-1}$$

$$\text{Avogadro's number } N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$$

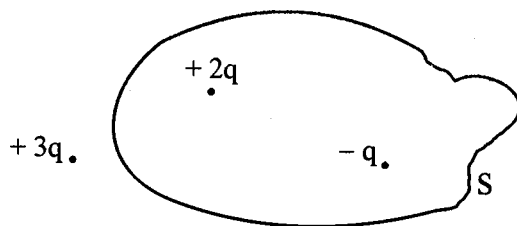
$$\text{Radius of earth} = 6400 \text{ km}$$

QUESTION PAPER CODE 51/1/1

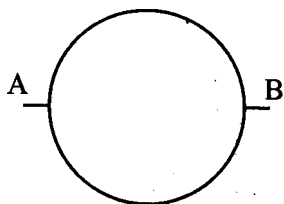
1. In which orientation, a dipole placed in a uniform electric field is in (i) stable, (ii) unstable equilibrium? 1
2. Which part of electromagnetic spectrum has largest penetrating power? 1
3. A plot of magnetic flux ( $\phi$ ) versus current (I) is shown in the figure for two inductors A and B. Which of the two has larger value of self inductance? 1



4. Figure shows three point charges,  $+2q$ ,  $-q$  and  $+3q$ . Two charges  $+2q$  and  $-q$  are enclosed within a surface 'S'. What is the electric flux due to this configuration through the surface 'S'? 1



5. A glass lens of refractive index 1.45 disappears when immersed in a liquid. What is the value of refractive index of the liquid? 1
6. What is the ratio of radii of the orbits corresponding to first excited state and ground state in a hydrogen atom? 1
7. A wire of resistance  $8R$  is bent in the form of a circle. What is the effective resistance between the ends of a diameter AB? 1

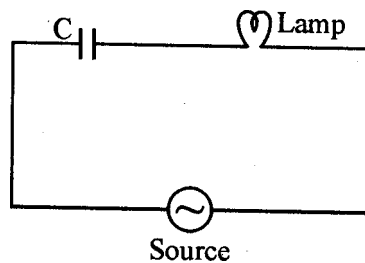


8. State the conditions for the phenomenon of total internal reflection to occur. 1
9. Explain the function of a repeater in a communication system. 2
10. (i) Write two characteristics of a material used for making permanent magnets. 2  
(ii) Why is core of an electromagnet made of ferromagnetic materials ?

**OR**

Draw magnetic field lines when a (i) diamagnetic, (ii) paramagnetic substance is placed in an external magnetic field. Which magnetic property distinguishes this behaviour of the field lines due to the two substances ?

11. Draw the circuit diagram of an illuminated photodiode in reverse bias. How is photodiode used to measure light intensity ? 2
12. An electric lamp having coil of negligible inductance connected in series with a capacitor and an AC source is glowing with certain brightness. How does the brightness of the lamp change on reducing the (i) capacitance, and (ii) the frequency ? Justify your answer. 2



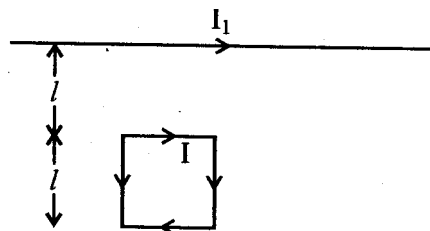
13. Arrange the following electromagnetic radiations in ascending order of their frequencies : 2
- (i) Microwave  
(ii) Radio wave  
(iii) X-rays  
(iv) Gamma rays

Write two uses of any one of these.

14. The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. If focal length of the lens is 12 cm, find the refractive index of the material of the lens. 2
15. An electron is accelerated through a potential difference of 100 volts. What is the de-Broglie wavelength associated with it ? To which part of the electromagnetic spectrum does this value of wavelength correspond ? 2
16. A heavy nucleus X of mass number 240 and binding energy per nucleon 7.6 MeV is split into two fragments Y and Z of mass numbers 110 and 130. The binding energy of nucleons in Y and Z is 8.5 MeV per nucleon. Calculate the energy Q released per fission in MeV. 2
17. (a) The bluish colour predominates in clear sky. 2  
(b) Violet colour is seen at the bottom of the spectrum when white light is dispersed by a prism.  
State reasons to explain these observations.
18. Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive materials having work functions  $W_1$  and  $W_2$  ( $W_1 > W_2$ ). On what factors does the (i) slope and (ii) intercept of the lines depend ? 2
19. A parallel plate capacitor is charged by a battery. After sometime the battery is disconnected and a dielectric slab with its thickness equal to the plate separation is inserted between the plates. How will (i) the capacitance of the capacitor, (ii) potential difference between the plates and (iii) the energy stored in the capacitor be affected ?  
Justify your answer in each case. 3
20. Write the principle of working of a potentiometer. Describe briefly, with the help of a circuit diagram, how a potentiometer is used to determine the internal resistance of a given cell. 3
21. Write the expression for the magnetic moment ( $\vec{m}$ ) due to a planar square loop of side ' $l$ ' carrying a steady current  $I$  in a vector form.

In the given figure this loop is placed in a horizontal plane near a long straight conductor carrying a steady current  $I_1$  at a distance  $l$  as shown. Give reasons to explain that the loop will experience a net force but no torque. Write the expression for this force acting on the loop.

3



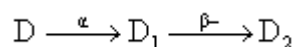
22. (a) Depict the equipotential surfaces for a system of two identical positive point charges placed a distance 'd' apart.
- (b) Deduce the expression for the potential energy of a system of two point charges  $q_1$  and  $q_2$  brought from infinity to the points  $\vec{r}_1$  and  $\vec{r}_2$  respectively in the presence of external electric field  $\vec{E}$ .

3

23. What is an unpolarized light ? Explain with the help of suitable ray diagram how an unpolarized light can be polarized by reflection from a transparent medium. Write the expression for Brewster angle in terms of the refractive index of denser medium.

3

24. (i) Define 'activity' of a radioactive material and write its S.I. unit.
- (ii) Plot a graph showing variation of activity of a given radioactive sample with time.
- (iii) The sequence of stepwise decay of a radioactive nucleus is



If the atomic number and mass number of  $D_2$  are 71 and 176 respectively, what are their corresponding values for D ?

3

25. A long straight wire of a circular cross-section of radius 'a' carries a steady current 'I'. The current is uniformly distributed across the cross-section. Apply Ampere's circuital law to calculate the magnetic field at a point 'r' in the region for (i)  $r < a$  and (ii)  $r > a$ .

3

**OR**

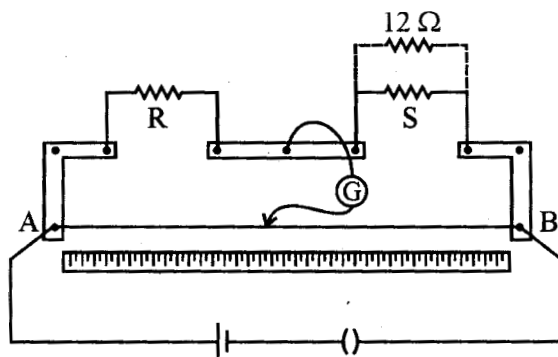
State the underlying principle of working of a moving coil galvanometer. Write two reasons why a galvanometer can not be used as such to measure current in a given circuit. Name any two factors on which the current sensitivity of a galvanometer depends.

26. What is space wave propagation ? Give two examples of communication system which use space wave mode.

A TV tower is 80 m tall. Calculate the maximum distance upto which the signal transmitted from the tower can be received.

3

27. In a meter bridge, the null point is found at a distance of 40 cm from A. If a resistance of  $12\ \Omega$  is connected in parallel with S, the null point occurs at 50.0 cm from A. Determine the values of R and S.



28. Describe briefly, with the help of a labelled diagram, the basic elements of an A.C. generator. State its underlying principle. Show diagrammatically how an alternating emf is generated by a loop of wire rotating in a magnetic field. Write the expression for the instantaneous value of the emf induced in the rotating loop.

5

**OR**

A series LCR circuit is connected to an ac source having voltage  $v = v_m \sin \omega t$ . Derive the expression for the instantaneous current I and its phase relationship to the applied voltage.

Obtain the condition for resonance to occur. Define 'power factor'. State the conditions under which it is (i) maximum and (ii) minimum.

29. State Huygens's principle. Show, with the help of a suitable diagram, how this principle is used to obtain the diffraction pattern by a single slit.

Draw a plot of intensity distribution and explain clearly why the secondary maxima become weaker with increasing order (n) of the secondary maxima.

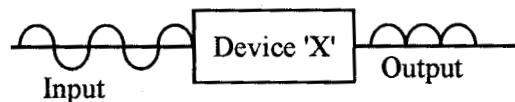
5

OR

Draw a ray diagram to show the working of a compound microscope. Deduce an expression for the total magnification when the final image is formed at the near point.

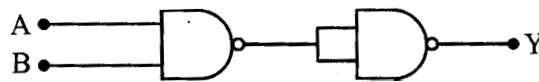
In a compound microscope, an object is placed at a distance of 1.5 cm from the objective of focal length 1.25 cm. If the eye piece has a focal length of 5 cm and the final image is formed at the near point, estimate the magnifying power of the microscope.

30. (a) Explain the formation of depletion layer and potential barrier in a p-n junction.
- (b) In the figure given below the input waveform is converted into the output waveform by a device 'X'. Name the device and draw its circuit diagram.



- (c) Identify the logic gate represented by the circuit as shown and write its truth table.

5

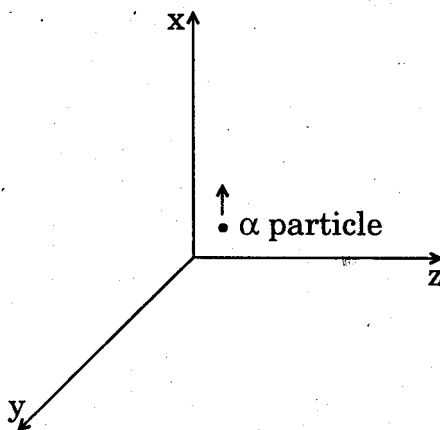


OR

- (a) With the help of the circuit diagram explain the working principle of a transistor amplifier as an oscillator.
- (b) Distinguish between a conductor, a semiconductor and an insulator on the basis of energy band diagrams.

### QUESTION PAPER CODE 51/1

1. Name the physical quantity whose S.I. unit is  $\text{JC}^{-1}$ . Is it a scalar or a vector quantity ? 1
2. A beam of particles projected along + x-axis, experiences a force due to a magnetic field along the + y-axis. What is the direction of the magnetic field ? 1



3. Define self-inductance of a coil. Write its S.I. unit. 1
4. A converging lens is kept coaxially in contact with a diverging lens – both the lenses being of equal focal lengths. What is the focal length of the combination ? 1
5. Define ionisation energy. What is its value for a hydrogen atom ? 1
6. Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires. 1
7. Name the part of electromagnetic spectrum whose wavelength lies in the range of  $10^{-10}$  m. Give its one use. 1
8. When light travels from a rarer to a denser medium, the speed decreases. Does this decrease in speed imply a decrease in the energy carried by the light wave ? Justify your answer. 1
9. Deduce the expression for the magnetic dipole moment of an electron orbiting around the central nucleus. 2



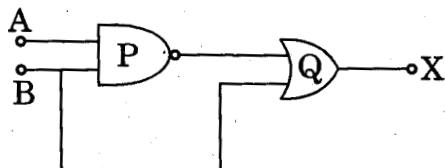
10. A spherical conducting shell of inner radius  $r_1$  and outer radius  $r_2$  has a charge 'Q'. A charge 'q' is placed at the centre of the shell.
- (a) What is the surface charge density on the (i) inner surface, (ii) outer surface of the shell ?
- (b) Write the expression for the electric field at a point  $x > r_2$  from the centre of the shell. 2
11. Draw a sketch of a plane electromagnetic wave propagating along the z-direction. Depict clearly the directions of electric and magnetic fields varying sinusoidally with z. 2
12. Show that the electric field at the surface of a charged conductor is given by  $\vec{E} = \frac{\sigma}{\epsilon_0} \hat{n}$ , where  $\sigma$  is the surface charge density and  $\hat{n}$  is a unit vector normal to the surface in the outward direction. 2
13. Two identical loops, one of copper and the other of aluminium, are rotated with the same angular speed in the same magnetic field. Compare (i) the induced emf and (ii) the current produced in the two coils. Justify your answer. 2
14. An  $\alpha$ -particle and a proton are accelerated from rest by the same potential. Find the ratio of their de Broglie wavelengths. 2
15. Write two factors justifying the need of modulating a signal.  
A carrier wave of peak voltage 12 V is used to transmit a message signal. What should be the peak voltage of the modulating signal in order to have a modulation index of 75% ? 2
16. Write Einstein's photoelectric equation. State clearly the three salient features observed in photoelectric effect, which can be explained on the basis of the above equation. 2
17. Draw a plot of potential energy of a pair of nucleons as a function of their separation. Write two important conclusions which you can draw regarding the nature of nuclear forces. 2

**OR**

Draw a plot of the binding energy per nucleon as a function of mass number for a large number of nuclei,  $2 < A < 240$ . How do you explain the constancy of binding energy per nucleon in the range  $30 < A < 170$  using the property that nuclear force is short-ranged ?

2

18. (i) Identify the logic gates marked P and Q in the given logic circuit.



- (ii) Write down the output at X for the inputs  $A = 0, B = 0$  and  $A = 1, B = 1$ .

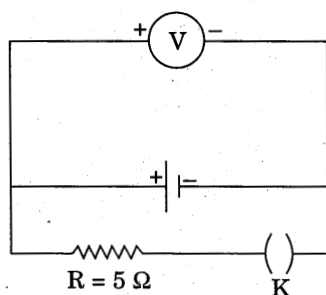
2

19. Which mode of propagation is used by short wave broadcast services having frequency range from a few MHz upto 30 MHz ? Explain diagrammatically how long distance communication can be achieved by this mode. Why is there an upper limit to frequency of waves used in this mode ?

3

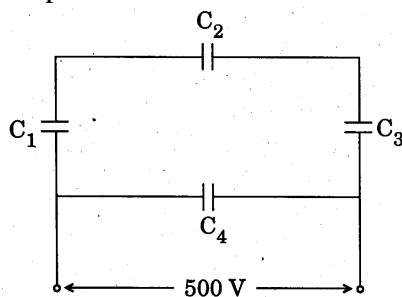
20. Write any two factors on which internal resistance of a cell depends. The reading on a high resistance voltmeter, when a cell is connected across it, is 2.2 V. When the terminals of the cell are also connected to a resistance of  $5 \Omega$  as shown in the circuit, the voltmeter reading drops to 1.8 V. Find the internal resistance of the cell.

3



21. A network of four capacitors each of  $12 \mu\text{F}$  capacitance is connected to a 500 V supply as shown in the figure. Determine (a) equivalent capacitance of the network and (b) charge on each capacitor.

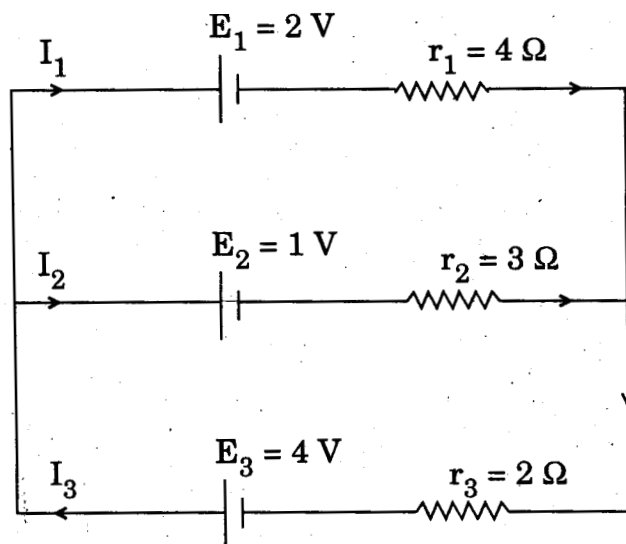
5



22. (i) Draw a neat labelled ray diagram of an astronomical telescope in normal adjustment. Explain briefly its working.
- (ii) An astronomical telescope uses two lenses of powers 10 D and 1 D. What is its magnifying power in normal adjustment ? 3

**OR**

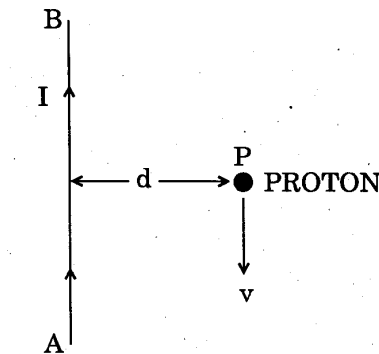
- (i) Draw a neat labelled ray diagram of a compound microscope. Explain briefly its working.
- (ii) Why must both the objective and the eye-piece of a compound microscope have short focal lengths ? 3
23. In Young's double slit experiment, the two slits 0.15 mm apart are illuminated by monochromatic light of wavelength 450 nm. The screen is 1.0 m away from the slits.
- (a) Find the distance of the second (i) bright fringe, (ii) dark fringe from the central maximum.
- (b) How will the fringe pattern change if the screen is moved away from the slits ? 3
24. State Kirchhoff's rules. Use these rules to write the expressions for the currents  $I_1$ ,  $I_2$  and  $I_3$  in the circuit diagram shown. 3



25. (a) Write symbolically the  $\beta^-$  decay process of  ${}^A_Z\text{P}$ .  
 (b) Derive an expression for the average life of a radionuclide. Give its relationship with the half-life. 3
26. How does an unpolarised light get polarised when passed through a polaroid ?  
 Two polaroids are set in crossed positions. A third polaroid is placed between the two making an angle  $\theta$  with the pass axis of the first polaroid. Write the expression for the intensity of light transmitted from the second polaroid. In what orientations will the transmitted intensity be (i) minimum and (ii) maximum ? 3
27. An illuminated object and a screen are placed 90 cm apart. Determine the focal length and nature of the lens required to produce a clear image on the screen, twice the size of the object. 3
28. (a) With the help of a diagram, explain the principle and working of a moving coil galvanometer.  
 (b) What is the importance of a radial magnetic field and how is it produced ?  
 (c) Why is it that while using a moving coil galvanometer as a voltmeter a high resistance in series is required whereas in an ammeter a shunt is used ? 5

**OR**

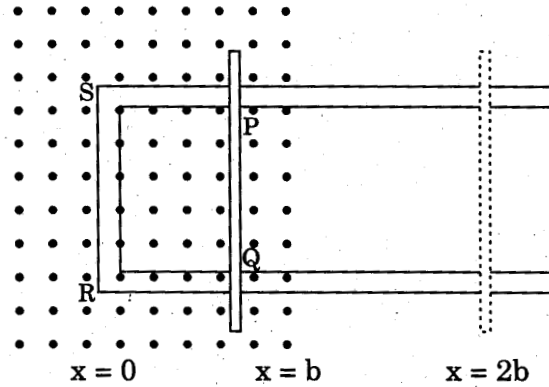
- (a) Derive an expression for the force between two long parallel current carrying conductors.  
 (b) Use this expression to define S.I. unit of current.  
 (c) A long straight wire AB carries a current  $I$ . A proton  $P$  travels with a speed  $v$ , parallel to the wire, at a distance  $d$  from it in a direction opposite to the current as shown in the figure. What is the force experienced by the proton and what is its direction ? 5



29. State Faraday's law of electromagnetic induction.

Figure shows a rectangular conductor PQRS in which the conductor PQ is free to move in a uniform magnetic field  $B$  perpendicular to the plane of the paper. The field extends from  $x = 0$  to  $x = b$  and is zero for  $x > b$ . Assume that only the arm PQ possesses resistance  $r$ . When the arm PQ is pulled outward from  $x = 0$  to  $x = 2b$  and is then moved backward to  $x = 0$  with constant speed  $v$ , obtain the expressions for the flux and the induced emf. Sketch the variations of these quantities with distance  $0 < x < 2b$ .

5



OR

Draw a schematic diagram of a step-up transformer. Explain its working principle. Deduce the expression for the secondary to primary voltage in terms of the number of turns in the two coils. In an ideal transformer, how is this ratio related to the currents in the two coils?

How is the transformer used in large scale transmission and distribution of electrical energy over long distances?

5

30. (a) Draw the circuit diagrams of a p-n junction diode in (i) forward bias, (ii) reverse bias. How are these circuits used to study the  $V - I$  characteristics of a silicon diode? Draw the typical  $V - I$  characteristics.
- (b) What is a light emitting diode (LED)? Mention two important advantages of LEDs over conventional lamps.

5

OR

- (a) Draw the circuit arrangement for studying the input and output characteristics of an n-p-n transistor in CE configuration. With the help of these characteristics define (i) input resistance, (ii) current amplification factor.
- (b) Describe briefly with the help of a circuit diagram how an n-p-n transistor is used to produce self-sustained oscillations.

5

## Marking Scheme ó Physics (Theory)

### General Instructions :

1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the marking scheme are suggested answers. The content is thus indicative. If a student has given any other answer, which is different from the one given in the Marking Scheme, but conveys the meaning correctly, such answers should be given full weightage.
2. Evaluation is to be done as per instructions provided in the marking scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed.
3. If a question has parts, please award marks in the right hand side for each part. Marks awarded for different part of the question should then be totalled up and written in the left hand margin and circled.
4. If a question does not have any parts, marks are be awarded in the left hand margin only.
5. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.
6. No marks are to be deducted for the cumulative effect of an error. The student should be penalized only once.
7. Deduct  $\frac{1}{2}$  mark for writing wrong units, or missing units, in the final answer to numerical problems.
8. Formula can be taken as implied from the calculations even if not explicitly written.
9. In short answer type questions, asking for two features/characteristics/ properties, if a candidate writes three features/characteristics/properties or more, only the first two should be evaluated.
10. Full marks should be awarded to a candidate if his/her answer in a numerical problem, is close to the value given in this scheme.

**QUESTION PAPER CODE 55/1/1**

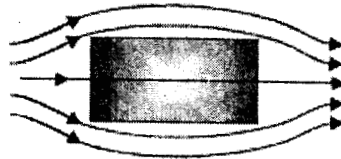
Q. No.	Expected Answer/value Points	Marks	Total Marks
1.	When dipole is (i) parallel to field (ii) antiparallel to the field (or correct fig of two cases.)	½ +½	1
2.	γ Rays.	1	1
3.	Line A	1	1
4.	Electric flux $\phi = \frac{q}{\epsilon_0}$	1	1
5.	1.45	1	1
6.	$r \propto n^2 \therefore \frac{r_1}{r_2} = 4: 1$ (award ½ mark if student writes only formula)	1	1
7.	$R_{effective} = 2R$	1	1
8.	(i) Refraction should take place from denser to rarer medium (ii) Angle of incidence should be greater than the critical angle.	½+½	1
9.	Function of repeater                      2		
	A repeater, picks up the signal from the transmitter, amplifies and retransmits it to the receiver sometimes with a change in carrier frequency. Repeaters are used to extend the range of a communication system.	2	2
10.	Two characteristics of material                      ½+½ Reason    1		
	(i) (a) High Coercivity (b) High Retentivity (c) High Permeability. <span style="float: right;">(any two)</span>	½+½	
	(ii) Because of high permeability and low retentivity.	½+½	2

OR

Drawing of magnetic field lines	$\frac{1}{2} + \frac{1}{2}$
Property to distinguish the behaviour	1

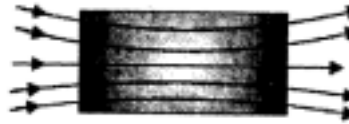
(i) Diamagnetic material

$\frac{1}{2}$



(ii) Paramagnetic material

$\frac{1}{2}$



Paramagnetic substance: permeability slightly greater than one/susceptibility small but positive.

Diamagnetic substance: permeability very slightly less than one/susceptibility very small but negative.

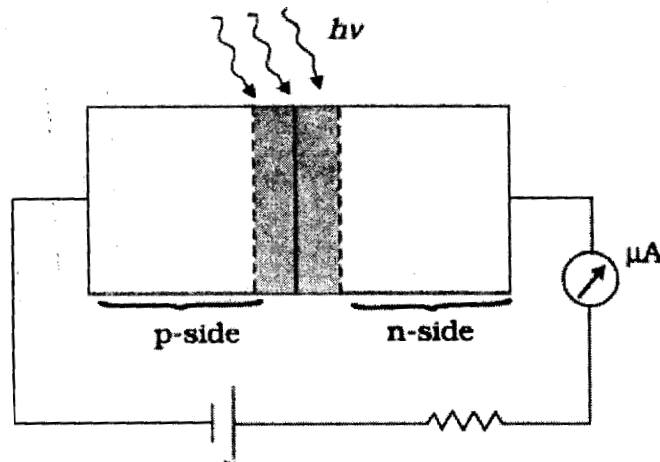
$\frac{1}{2} + \frac{1}{2}$

2

11.

Circuit diagram	1
Explanation for measurement of light intensity	1

Circuit diagram of an illuminated photodiode:



1



Explanation:

The magnitude of the photo current depends on the intensity of incident light (photo current is proportional to incident light intensity). Thus photo diode can be used to measure light intensity.

1 2

12.	Effect of change in capacitance	1
	Effect of change in frequency	1

(i)  $X_c = \frac{1}{\omega C} = \frac{1}{2\pi\nu C}$  1/2

As  $C$  decreases,  $X_c$  will increase. Hence brightness will decrease. 1/2

(ii)  $X_c = \frac{1}{\omega C} = \frac{1}{2\pi\nu C}$  1/2

As frequency ( $\nu$ ) decreases,  $X_c$  will increase. Hence brightness will decrease. 1/2 2

13.	Arrangement in ascending order of frequency	1
	Two uses of any one	1/2+1/2

Radio waves < Microwaves < X-rays < Gamma rays 1

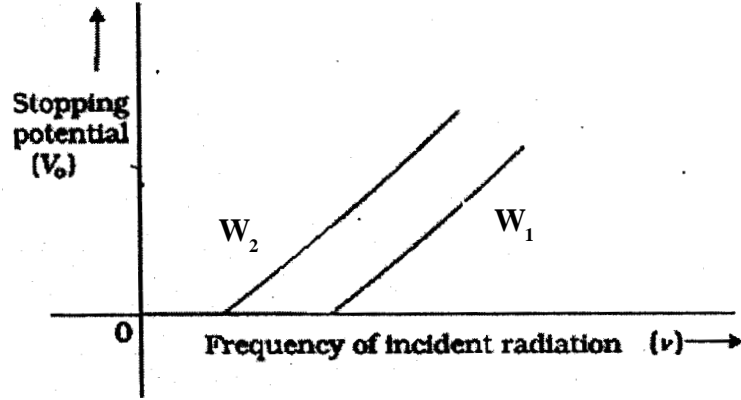
Two uses of any one of these. 1/2+1/2

14.	Formula	1
	Substitution and calculation	1

$\frac{1}{f} = (\mu - 1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$  1

$\frac{1}{12} = (\mu - 1) \left( \frac{1}{10} - \frac{1}{-15} \right) \Rightarrow \mu = 1.5$  1/2+1/2 2

15.	<table border="1"> <tbody> <tr> <td>Formula</td> <td>1</td> </tr> <tr> <td>Calculation of wavelength</td> <td>½</td> </tr> <tr> <td>Name of the part of spectrum</td> <td>½</td> </tr> </tbody> </table>	Formula	1	Calculation of wavelength	½	Name of the part of spectrum	½		
Formula	1								
Calculation of wavelength	½								
Name of the part of spectrum	½								
	$\lambda = \frac{h}{\sqrt{2meV}} \text{ or } \lambda = \frac{12.27 \text{ \AA}}{\sqrt{V}}$	1							
	$\lambda = \frac{12.27 \text{ \AA}}{\sqrt{100}} = 12.27 \text{ \AA}$	½							
	This wavelength corresponds to the <b>X rays</b> .	½	2						
16.	<table border="1"> <tbody> <tr> <td>Reaction</td> <td>1</td> </tr> <tr> <td>Calculation of energy released</td> <td>1</td> </tr> </tbody> </table>	Reaction	1	Calculation of energy released	1				
Reaction	1								
Calculation of energy released	1								
	$X^{240} \rightarrow Y^{110} + Z^{130} + Q$	1							
	Energy released per nucleon = 8.5 MeV - 7.6 MeV = 0.9 MeV								
	Therefore energy released = 0.9 × 240 MeV = 216 MeV	1	2						
	Alternatively:								
	Energy released = [240 × 8.5 – 7.6 ( 110+130)] MeV = 216 MeV								
17.	<table border="1"> <tbody> <tr> <td>Reason of predominance of bluish colour</td> <td>1</td> </tr> <tr> <td>Reason of violet colour</td> <td>1</td> </tr> </tbody> </table>	Reason of predominance of bluish colour	1	Reason of violet colour	1				
Reason of predominance of bluish colour	1								
Reason of violet colour	1								
	(a) As per Rayleigh's law ( scattering $\propto 1/\lambda^4$ ), lights of shorter wavelengths scattered more by the atmospheric particles. This results in a dominance of bluish colour in the scattered light.	1							
	(b) In the visible spectrum, violet light having its shortest wavelength, has the highest refractive index. Hence it is deviated the most.	1	2						
18.	<table border="1"> <tbody> <tr> <td>Graph</td> <td>1</td> </tr> <tr> <td>Factors</td> <td>½+½</td> </tr> </tbody> </table>	Graph	1	Factors	½+½				
Graph	1								
Factors	½+½								



1

- (i) Slope is determined by  $h$  and  $e$ . (or slope is independent of the metal used)
- (ii) Work function of the metal.

$\frac{1}{2}$

$\frac{1}{2}$

2

19. Effect on (i) capacitance (ii) potential difference  
(iii) energy stored

1 + 1 + 1

- (i) Capacitance  $C = \frac{K\epsilon_0 A}{d}$ , Hence capacitance Increases  $K$  times.

$\frac{1}{2} + \frac{1}{2}$

- (ii) Potential difference  $V = \frac{V_0}{K}$ , Hence potential difference decreases by a factor  $K$ .

$\frac{1}{2} + \frac{1}{2}$

- (iii) Energy stored  $E = \frac{1}{2} CV^2$ , As capacitance becomes  $K$  times & potential difference becomes  $1/K$  times therefore energy stored becomes  $1/K$  times.

$\frac{1}{2} + \frac{1}{2}$

3

Alternatively:

Energy stored =  $Q^2/2C$ . As capacitance increases by a factor  $K$ , the energy stored will decrease by the same factor.

20. Working principle

$\frac{1}{2}$

Circuit diagram

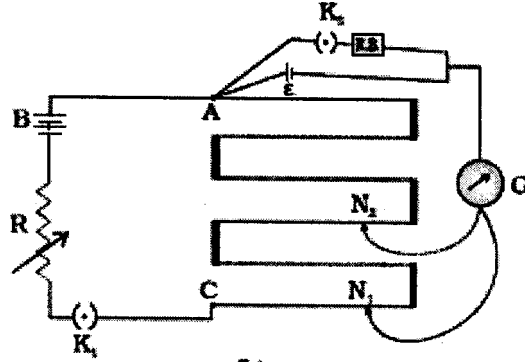
1

Determination of internal resistance

$\frac{1}{2}$

Working principle: When constant current flows through a wire of uniform cross section, then potential difference across the wire is directly proportional to the length.  $V \propto l$

1/2



1

With key  $K_2$  open, balance is obtained at length  $l_1$  ( $AN_1$ ). Then,

$$\varepsilon = \phi l_1 \quad (\phi = \text{potential gradient})$$

When key  $K_2$  is closed, the cell sends a current ( $I$ ) through the resistance box ( $R$ ). If  $V$  is the terminal potential difference of the cell and balance is obtained at length  $l_2$  ( $AN_2$ ),

$$V = \phi l_2$$

$$\text{But } \frac{\varepsilon}{V} = \frac{I(R+r)}{IR} = \left(1 + \frac{r}{R}\right)$$

1/2

$$\therefore \left(1 + \frac{r}{R}\right) = \frac{l_1}{l_2}$$

1/2

$$\Rightarrow r = \frac{(l_1 - l_2)}{l_2} R$$

1/2

3

21.

Expression for magnetic moment	1
Reason	1
Expression	1

$$\vec{m} = I \vec{A} \quad (\vec{A} = \text{area vector})$$

1

**(for students using the corrected current direction)**

Torque: The magnetic field due to the long current carrying wire is perpendicular to the plane of paper. Hence the force acting on each of the four sides is in the plane of the paper and the net torque is zero.

1

Alternatively

$\vec{m}$  is perpendicular to the plane of paper and  $\vec{B}$  is perpendicular to the plane of paper. Hence  $\vec{\tau} = \vec{m} \times \vec{B} = 0$

Force:

$$\text{Force on upper horizontal side} = \frac{Il \mu_0 I_1}{2\pi l} = \frac{I \mu_0 I_1}{2\pi} \text{ (attractive)} \quad \frac{1}{2}$$

$$\text{Force on lower horizontal side} = \frac{Il \mu_0 I_1}{2\pi(2l)} = \frac{I \mu_0 I_1}{4\pi} \text{ (repulsive)}$$

The direction of these forces being opposite to each other therefore net

$$\text{force} = \frac{\mu_0 I_1 I}{4\pi} \text{ (attractive)} \quad \frac{1}{2}$$

(The net force on the two vertical sides is zero)

3

**(for students using the given current direction)**

Torque: The magnetic field due to the long current carrying wire is perpendicular to the plane of paper. Hence the force acting on each of the four sides is in the plane of the paper and the net torque is zero.

Alternatively

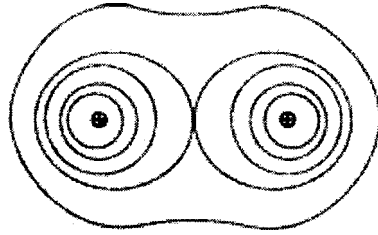
$\vec{m}$  is perpendicular to the plane of paper and  $\vec{B}$  is perpendicular to the plane of paper. Hence  $\vec{\tau} = \vec{m} \times \vec{B} = 0$

Force: Award this mark irrespective of result obtained or calculation done by the students.

22.

Drawing of equipotential surface	1
Expression of potential energy	2

(a) Equipotential surfaces for a system of two identical positive charges:



1

(b) Expression for the potential energy of a system of two point charges in external field:

Work done in bringing the charge  $q_1$  from infinity to  $\mathbf{r}_1$ .

1/2

$$\text{Work done} = q_1 V(\mathbf{r}_1)$$

Work done in bringing the charge  $q_2$  from infinity to  $\mathbf{r}_2$ .

$$\text{Work done against the external electric field} = q_2 V(\mathbf{r}_2)$$

1/2

Work done = work done against the external electric field + Work done on  $q_2$  against the field due to  $q_1$

1/2

$$= q_2 V(\mathbf{r}_2) + \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

Potential energy of the system

= the total work done in assembling the configuration

$$= q_1 V(\mathbf{r}_1) + q_2 V(\mathbf{r}_2) + \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

1/2

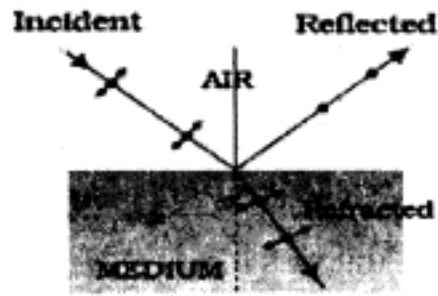
3

23.

Definition	1
Method of polarization	1
Expression of Brewster angle	1

In an unpolarised light the vibrations of electric field vector are in every plane perpendicular to the direction of propagation of light.

1



When unpolarised light is incident on the boundary between two transparent media, the reflected light is polarised with its electric vector perpendicular to the plane of incidence when the refracted and reflected rays make a right angle with each other.

1

Brewster angle:  $\mu = \tan i_p$

1

3

24.

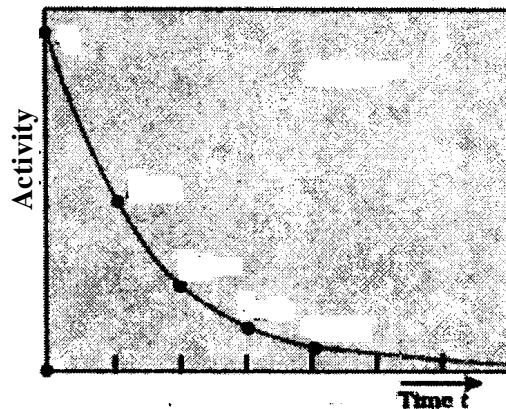
i) Definition	$\frac{1}{2}$
SI unit	$\frac{1}{2}$
ii) Graph	1
iii) Values for D	$\frac{1}{2} + \frac{1}{2}$

(i) The total decay rate (of a sample) at the given instant, i.e., the number of radionuclides disintegrating per unit time is called the *activity* of that sample. The SI unit for activity is becquerel (Bq).

$\frac{1}{2}$

$\frac{1}{2}$

(ii) Graph:



1

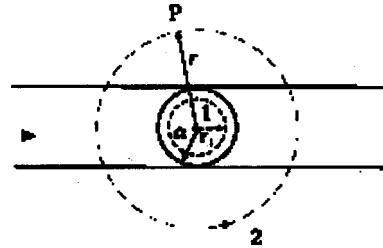
(iii) 72 and 180

$\frac{1}{2} + \frac{1}{2}$

3

25.

Diagram	1/2
Calculation of magnetic field (i) inside (ii) outside	1 1/2 + 1



1/2

- (a) Consider the case  $r < a$ . The Amperian loop is a circle labelled 1. For this loop, taking the radius of the circle to be  $r$ ,  $L = 2 \pi r$

$$\text{Now the current enclosed } I_e = I \left( \frac{\pi r^2}{\pi a^2} \right) = \frac{I r^2}{a^2}$$

1/2

Using Ampere's law,

$$B (2\pi r) = \frac{\mu_0 I r^2}{a^2} \Rightarrow B = \frac{\mu_0 I r}{2\pi a^2}$$

1

- (b) Consider the case  $r > a$ . The Amperian loop, labelled 2, is a circle concentric with the cross-section. For this loop,  $L = 2 \pi r$

$$I_e = \text{Current enclosed by the loop} = I$$

1/2

$$B (2\pi r) = \mu_0 I$$

$$\Rightarrow B = \frac{\mu_0 I}{2\pi r}$$

1/2

3

**OR**

Principle	1
Two reasons	1/2+1/2
Two factors	1/2+1/2



**Principle:** Torque acts on a current carrying coil suspended in magnetic field.  
 $(\tau = NIAB \sin \theta)$

1

**Two reasons:** (i) Galvanometer is a very sensitive device, it gives a full-scale deflection for a current of the order of a few  $\mu\text{A}$ .

(ii) For measuring currents, the galvanometer has to be connected in series, and as it has a finite resistance, this will change the value of the current in the circuit.

$\frac{1}{2} + \frac{1}{2}$

**Two factors:** The current sensitivity of a moving coil galvanometer can be increased by (i) increasing the number of turns (ii) increasing area of the loop. (iii) increasing magnetic field (iv) decreasing the torsional constant of the suspension wire. (Any two)

$\frac{1}{2} + \frac{1}{2}$

3

26.

Space wave propagation	1
Two examples	$\frac{1}{2} + \frac{1}{2}$
Calculation of maximum distance	1

When waves travel in space in a straight line from the transmitting antenna to the receiving antenna, this mode of propagation is called the space wave propagation.

1

Examples: Television broadcast, microwave links, satellite communication

(Any two)

$\frac{1}{2} + \frac{1}{2}$

$$d = \sqrt{2hR} = \sqrt{2 \times 80 \times 6.4 \times 10^6} = 32 \text{ km}$$

$\frac{1}{2} + \frac{1}{2}$

3

27.

Determination of values of $R$ and $S$	$1\frac{1}{2} + 1\frac{1}{2}$
--	-------------------------------

$$\frac{R}{S} = \frac{40}{60} = \frac{2}{3}$$

$\frac{1}{2}$

$$\frac{R(12+S)}{12S} = \frac{50}{50} = 1$$

$1\frac{1}{2}$

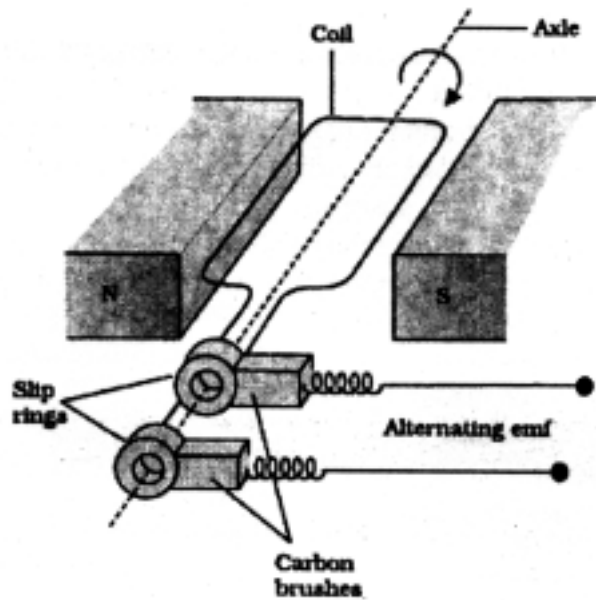
$$\Rightarrow R = 4\Omega \text{ and } S = 6\Omega$$

$\frac{1}{2} + \frac{1}{2}$

3

28.

Description of basic elements with Labelled diagram	2
Underlying principle	1
Production of emf in loop	1½
Expression	½



1

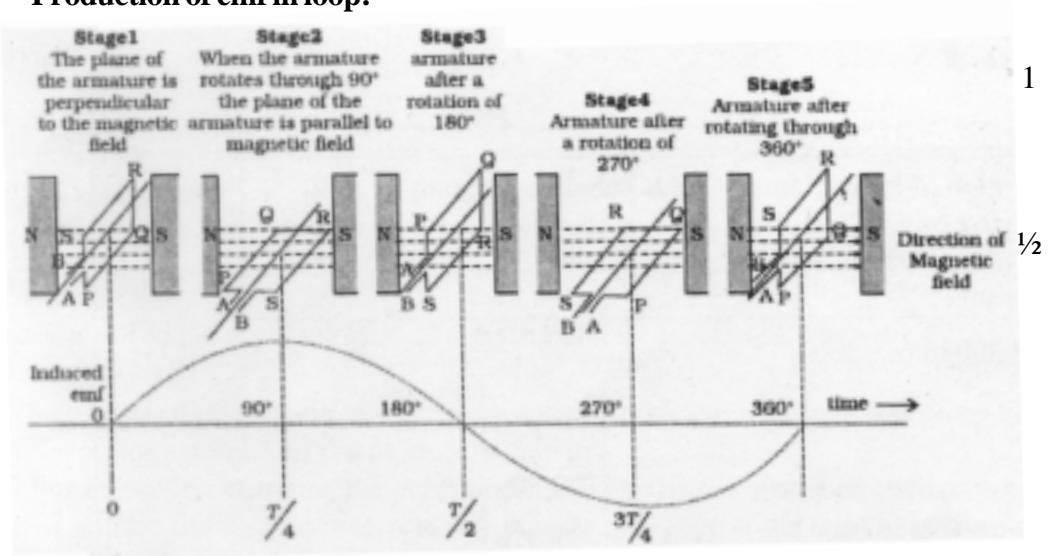
It consists of a coil mounted on a rotor shaft. The axis of rotation of the coil is perpendicular to the direction of the magnetic field. The coil (called armature) is mechanically rotated in the uniform magnetic field by some external means. The ends of the coil are connected to an external circuit by means of slip rings and brushes.

1

**Underlying principle:** As the coil rotates in a magnetic field **B**, the effective area of the loop (the face perpendicular to the field) which is  $A \cos \theta$ , where  $\theta$  is the angle between area (**A**) and magnetic field (**B**) changes continuously. Hence, magnetic flux linked with the coil keeps on changing with time and an induced emf is produced.

1

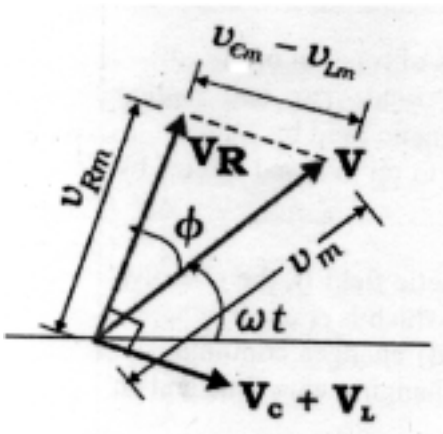
**Production of emf in loop:**



The instantaneous value of the emf is  $\epsilon = NBA\omega \sin\omega t$

**OR**

Derivation of Expression for instantaneous current	3
Obtaining condition of resonance	1/2
Definition of power factor	1/2
Condition of maximum and minimum power factor	1/2+1/2



From the phasor diagram, we have

$$v_m^2 = v_{Rm}^2 + (v_{Cm} - v_{Lm})^2$$

$$= i_m^2 [R^2 + (X_C - X_L)^2]$$

$$i_m = \frac{v_m}{\sqrt{R^2 + (X_C - X_L)^2}} \quad \frac{1}{2}$$

The current is seen to lead the voltage by an angle  $\phi$ , where

$$\tan \phi = \frac{X_C - X_L}{R}, \quad \frac{1}{2}$$

hence  $i = i_m \sin(\omega t + \phi)$  1/2

(Accept the analytical approach also)

Where  $i_m = \frac{v_m}{\sqrt{R^2 + (X_C - X_L)^2}}$  and  $\phi = \tan^{-1} \left[ \frac{\left( \omega L - \frac{1}{\omega C} \right)}{R} \right]$  1/2

Condition of resonance:  $\omega L - \frac{1}{\omega C} = 0$  or  $\omega L = \frac{1}{\omega C}$  or  $\omega = \frac{1}{\sqrt{LC}}$  1/2

Power factor equals the cosine of the phase angle, i.e.,

Power factor  $\cos \phi = \frac{R}{Z}$  1/2

Power factor is maximum when  $\cos \phi = 1$ , i.e. when  $R=Z$  or  $X_L = X_C$  1/2

Power factor is minimum when  $\cos \phi = 0$ , i.e. when  $R = 0$  1/2

5

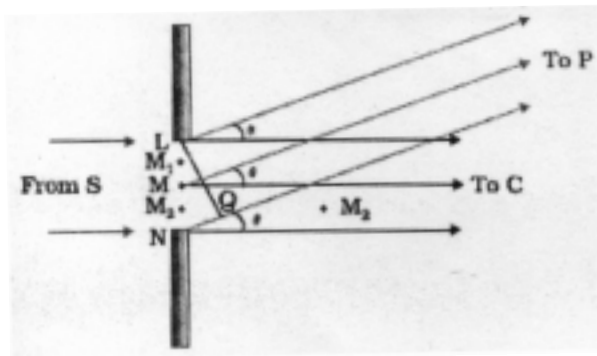
29.

Statement of Huygen's principle	1
Application to diffraction pattern	2
Plot	1
Explanation	1

**Huygenís principle:** Each point of wavefront is the source of a secondary disturbance and the wavelets emanating from these points spread out in all directions with the speed of the wave. The common tangent/ forward envelope, to all these secondary wavelets gives the new wavefront at later time. 1

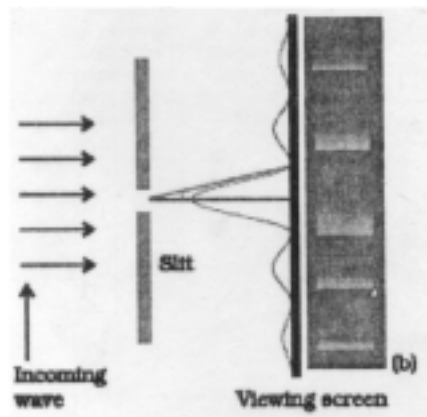
**Application to diffraction pattern:** All the points of incoming wavefront (parallel to the plane of slit) are in phase with plane of slit. However the contribution of the secondary wavelets from different points, at any point, on the observation screen have phase differences dependent on the corresponding path differences. Total contribution, at any point, may add up to give a maxima or minima dependent on the phase differences.

1



1

**Plot of intensity distribution and explanation:**



1

The central point is a maxima as the contribution of all secondary wavelet pairs are in phase here. Consider next a point on the screen where an angle  $\theta = 3\lambda/2a$ . Divide the slit into three equal parts. Here the first two-thirds of the slit can be divided into two halves which have a  $\lambda/2$  path difference. The contributions of these two halves cancel. Only the remaining one-third of the slit contributes to the intensity at a point between the two minima. Hence, this will be much weaker than the central maximum (where the entire slit contributes in phase). We can similarly show that there are maxima at  $\theta = (n + 1/2) \lambda/a$  with  $n = 2, 3$ , etc. These become weaker with increasing  $n$ , since only one-fifth, one-seventh, etc., of the slit contributes in these cases.

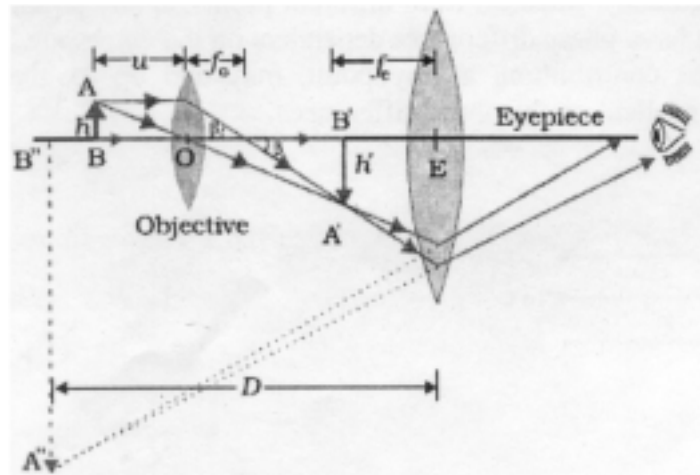
1

5

OR

Labelled Ray diagram	1
Derivation	2
Estimation of magnifying power	2

**Labelled Ray diagram:**



1

**Expression for total magnification:**

Magnification due to the **objective**,

$$m_o = \frac{h'}{h} = \frac{L}{f_o}$$

1/2

Magnification  $m_e$ , due to eyepiece, (when the final image is formed at the near point)

$$m_e = \left(1 + \frac{D}{f_e}\right)$$

1/2

**Total magnification,**

$$m = m_o m_e = \frac{L}{f_o} \left(1 + \frac{D}{f_e}\right)$$

1

Estimation of magnifying power :

Given :  $u_o = -1.5 \text{ cm}$  ;  $f_o = 1.25 \text{ cm}$

we have

$$\frac{1}{f_0} = \frac{1}{v_0} - \frac{1}{u_0}$$

$$\frac{1}{1.25} = \frac{1}{v_0} - \frac{1}{-1.5} \Rightarrow v_0 = 7.5 \text{ cm}$$

$$m \approx \frac{v_0}{u_0} \left( 1 + \frac{D}{f_c} \right)$$

$$= \frac{7.5}{-1.5} \left( 1 + \frac{25}{5} \right) \Rightarrow m = -30$$

1/2

1/2

1/2

1/2

5

30.

Explanation of depletion layer and potential barrier	1+1
Name of device and circuit diagram	1/2+1
Identification of logic gate and truth table	1/2+1

**(a) depletion region:** Due to the concentration gradient across p-, and n-sides, holes diffuse from p-side to n-side ( $p \rightarrow n$ ) and electrons diffuse from n-side to p-side ( $n \rightarrow p$ ). As the electrons diffuse from  $n \rightarrow p$ , a layer of positive charge (or positive space-charge region) is developed on n-side of the junction. Similarly as the holes diffuse, a layer of negative charge (or negative space-charge region) is developed on the p-side of the junction. This space-charge region on either side of the junction together is known as *depletion region*.

1

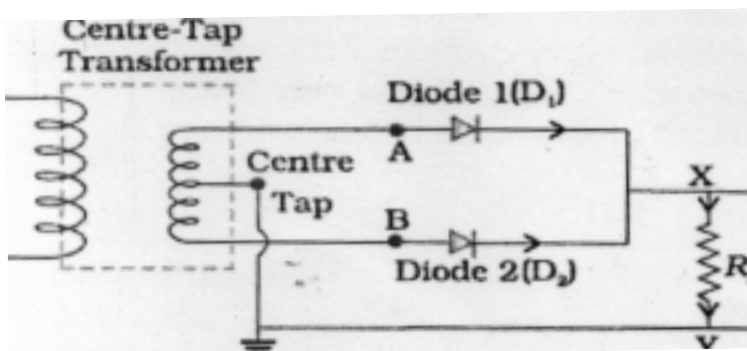
**Barrier potential:**

The loss of electrons from the n-region and the gain of electron by the p-region causes a difference of potential across the junction of the two regions. The polarity of this potential is such as. to oppose further flow of carriers.

1

**(b) Full wave rectifier**

1/2



1

1/2

(c) AND Gate

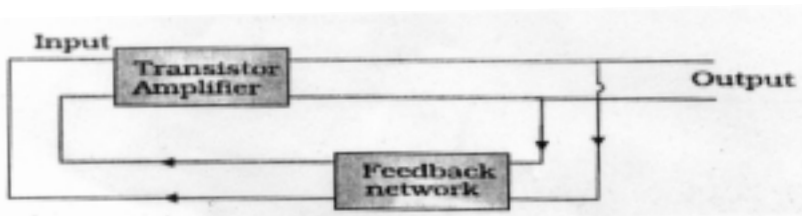
1

Input		Output
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

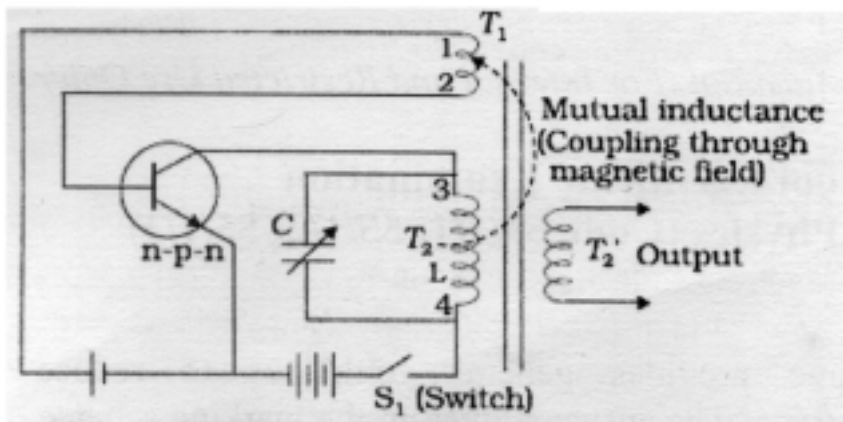
5

OR

Circuit diagram	1
Working principle	2½
Distinction	1½



1

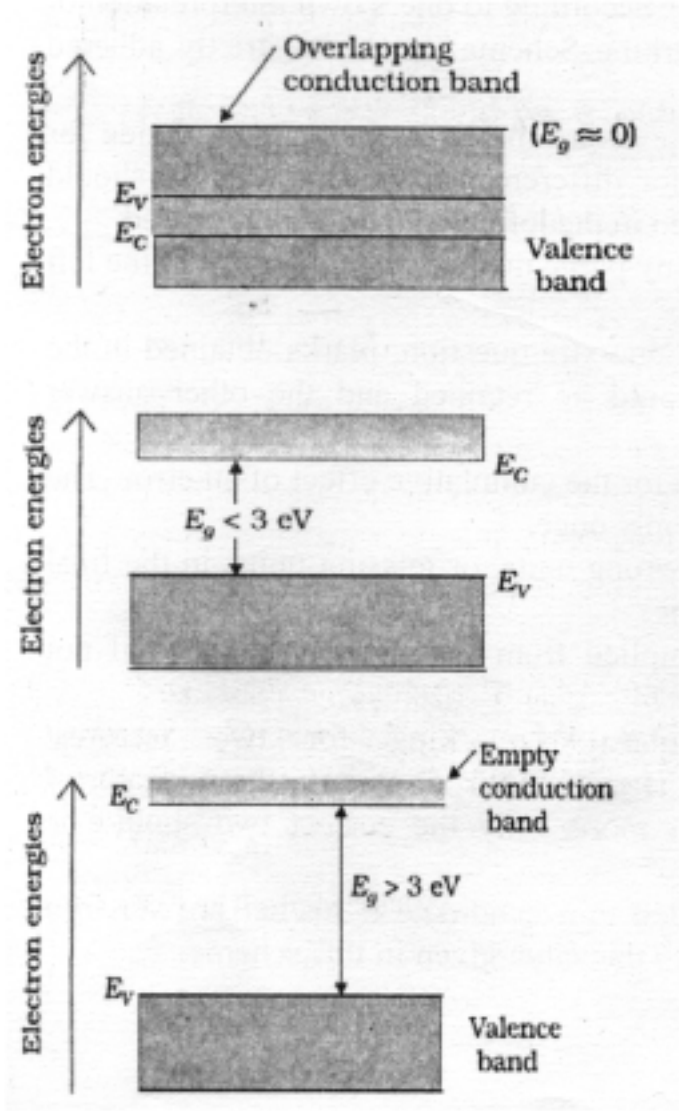


**Working principle:** In an oscillator, we get ac output without any external input signal, i.e. the output in an oscillator is *self-sustained*. To attain this, a portion of the output power of an amplifier, is returned back (feedback) to the input *in phase* with the starting power.

1½



The energy band diagrams, showing the distinction between a conductor, a semiconductor and an insulator are shown below:



1/2

1/2

1/2

5

**QUESTION PAPER CODE 55/1**

- |    |  |         |   |
|----|--|---------|---|
| 1. | Electric potential, scalar   | 1/2+1/2 | 1 |
| 2. | Negative Z direction ( $-\hat{k}$ )  | 1       | 1 |
| 3. | Magnetic flux linked through a coil when current flowing through is unity./<br>Induced emf in a coil when current is changing at the unit rate.<br>SI unit is henry.                                 | 1/2+1/2 | 1 |
| 4. | $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$ <p>as <math>f_1 = -f_2</math> (award 1 mark even if the student directly writes <math>f = \infty</math>)</p> <p><math>\therefore f = \infty</math></p> | 1/2+1/2 | 1 |
| 5. | Minimum energy required to free an electron from the ground state.<br>Its value for hydrogen atom is 13.6 eV   | 1/2+1/2 | 1 |
| 6. | $I = n_x e A v_x = n_y e A v_y$ $\Rightarrow \frac{v_x}{v_y} = \frac{n_y}{n_x} = \frac{n_y}{2n_y} = \frac{1}{2}$   | 1/2+1/2 | 1 |
| 7. | X-rays. Any one application.   | 1/2+1/2 | 1 |
| 8. | No, because energy depends on amplitude and frequency only. (or Energy does not depend on speed.)  | 1/2+1/2 | 1 |
| 9. | Derivation <span style="float: right;">2</span>  |         |   |
|    | Current due to revolution of electron $I = \frac{e}{T}$ and $T = \frac{2\pi r}{v}$   | 1/2     |   |
|    | $\therefore I = ev/2\pi r$   | 1/2     |   |
|    | Magnetic moment $\mu_l = I\pi r^2 = evr/2$   | 1       | 2 |

10.	(a) surface charge density on inner and outer surface	$\frac{1}{2} + \frac{1}{2}$
	(b) expression for electric field	1

(a) (i) surface charge density on inner surface

$$\sigma = \frac{-q}{4\pi r_1^2} \quad \frac{1}{2}$$

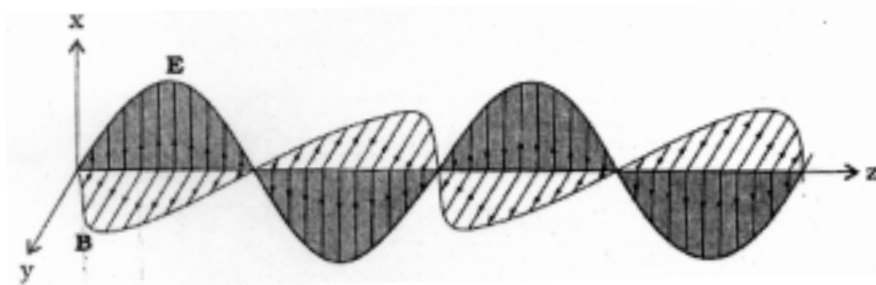
(ii) surface charge density on outer surface

$$\sigma = \frac{Q+q}{4\pi r_2^2} \quad \frac{1}{2}$$

Electric field at a (an outside) point distant  $x$  from centre of the shell

$$E = \frac{Q+q}{4\pi\epsilon_0 x^2} \quad 1 \quad 2$$

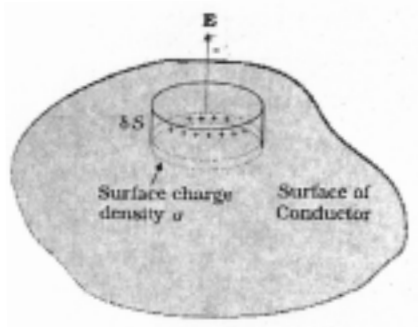
11.	Sketch of plane electromagnetic wave	1
	Directions of electric and magnetic fields	1



1+1 2

(Note: If diagram is drawn without indicating direction, award one mark. If only directions are written without any diagram, award one mark.)

12.	Derivation	2
-----	------------	---



$\frac{1}{2}$

$$E\delta S = \frac{\sigma\delta S}{\epsilon_0} \quad \frac{1}{2}$$

$$\Rightarrow E = \frac{\sigma}{\epsilon_0} \quad \frac{1}{2}$$

In vector form

$$\vec{E} = \frac{\sigma \hat{n}}{\epsilon_0} \quad \frac{1}{2}$$

**Alternatively:** Also accept the derivation of electric field on the surface of spherical shell. 1/2

$$\oint \vec{E} \cdot d\vec{s} = \frac{q}{\epsilon_0}$$

$$E \times 4\pi r^2 = \frac{q}{\epsilon_0} \quad \frac{1}{2}$$

$$E = \frac{q}{4\pi r^2 \epsilon_0}$$

$$\Rightarrow \vec{E} = \frac{\sigma \hat{n}}{\epsilon_0} \quad 1 \quad 2$$

13.	Comparison of induced emf	1
	Comparison of currents	1

(i) Emf produced in two coils is same because it depends only on the rate of change of magnetic flux which is same for both the loops. 1

(ii) Current in copper loop is more because resistivity/resistance of copper is less. ( $I=V/R$ ). 1      2

14.	Formula.	1/2
	Substitution and calculation	1 1/2

$$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mqV}} \quad \frac{1}{2}$$

As  $m_\alpha = 4m_p$  and  $q_\alpha = 2q_p$  1/2

$$\frac{\lambda_{\alpha}}{\lambda_{\beta}} = \frac{\sqrt{2m_{\beta}q_{\beta}}}{\sqrt{2m_{\alpha}q_{\alpha}}} = \frac{\sqrt{m_{\beta}q_{\beta}}}{\sqrt{4m_{\beta}2q_{\beta}}} = \frac{\sqrt{1}}{\sqrt{8}} = \frac{1}{2\sqrt{2}}$$

1

2

15.

Two factors	1
Calculation of peak voltage of modulating signal	1

- (i) Appropriate size of the antenna or aerial
- (ii) Effective power radiated by an antenna
- (iii) To avoid Mixing up of signals from different transmitters

(Any Two)

 $\frac{1}{2} + \frac{1}{2}$ 

Modulation Index

$$\mu = \frac{a_m}{a_c}$$

 $\frac{1}{2}$ 

$$\therefore 0.75 = \frac{a_m}{12V}$$

$$\Rightarrow a_m = 9V$$

 $\frac{1}{2}$ 

2

16.

Einstein's photoelectric equation	$\frac{1}{2}$
Three salient features	$\frac{1}{2}$ each

Einstein's photoelectric equation:

 $\frac{1}{2}$ 

$$K_{\max} = h\nu - \phi_0 = h(\nu - \nu_0)$$

- (i)  $K_{\max}$  of electrons depends linearly on  $\nu$ .
- (ii)  $K_{\max}$  is independent of intensity of radiation.
- (iii) There exists a threshold frequency  $\nu_0 (= \phi_0/h)$  for the metal surface, below which no photoelectric emission is possible. (No matter how intense the incident radiation may be or how long it falls on the surface.)

(iv) For  $\nu > \nu_0$ , photoelectric current is proportional to intensity of incident radiations.

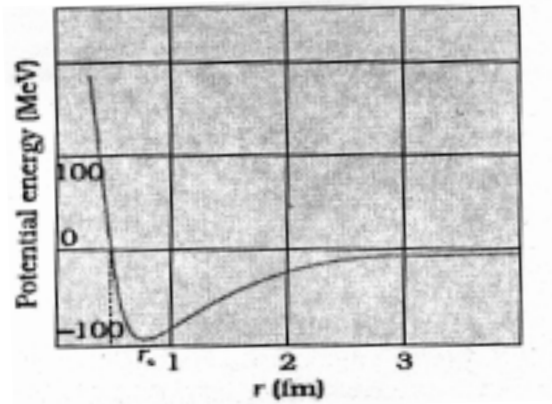
(Any three)

$3 \times \frac{1}{2}$

2

17.

Plot of potential energy of pair of nucleon	1
Two important conclusions	$\frac{1}{2} + \frac{1}{2}$



1

Two important conclusions:

- (i) The nuclear force between two nucleons falls rapidly to zero at distances more than a few femtometres;
- (ii) The nuclear force is attractive for  $r > r_0$ .
- (iii) The nuclear force is repulsive for  $r < r_0$ .
- (iv) The nuclear force is a strong force.

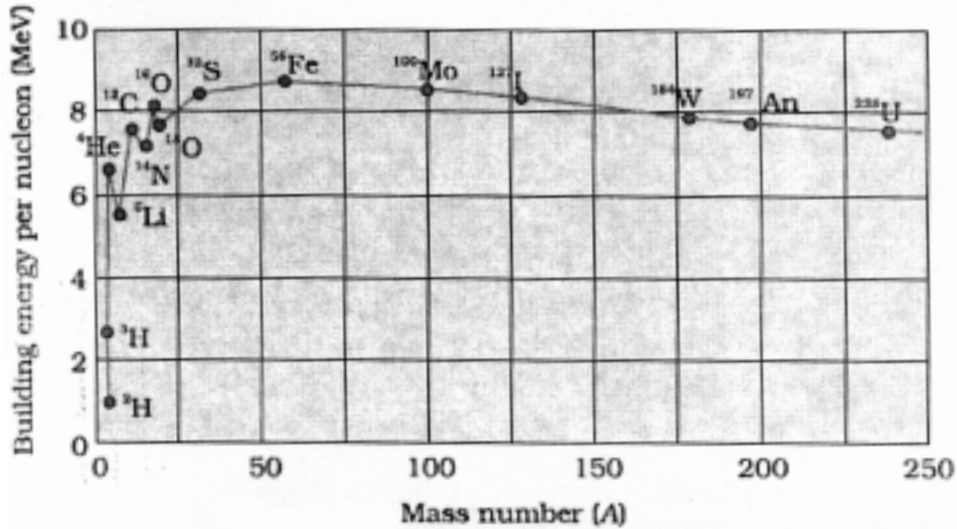
(Any two)

$\frac{1}{2} + \frac{1}{2}$

2

**OR**

Plot of Binding Energy per nucleon	1
Explanation	1



1

- (ii) The constancy of the binding energy in the range  $30 < A < 170$  is a consequence of the fact that the nuclear force is short-ranged.

If a nucleon can have a maximum of  $p$  neighbours within the range of nuclear force, its binding energy would be proportional to  $p$ . If we increase  $A$  by adding nucleons they will not change the binding energy of a nucleon inside. Since most of the nucleons in a large nucleus reside inside it and not on the surface, the change in binding energy per nucleon would be small. Hence the binding energy per nucleon is a constant. [ saturation property of nuclear force. ]

1

2

18.

Identification of gates P and Q	$\frac{1}{2} + \frac{1}{2}$
Output at X for the given inputs	$\frac{1}{2} + \frac{1}{2}$

- (i) P: NAND gate

$\frac{1}{2}$

Q: OR gate

$\frac{1}{2}$

- (ii) Inputs  $A = 0$  and  $B = 0$  then output  $X = 1$

$\frac{1}{2}$

Inputs  $A = 1$  and  $B = 1$  then output  $X = 1$

$\frac{1}{2}$

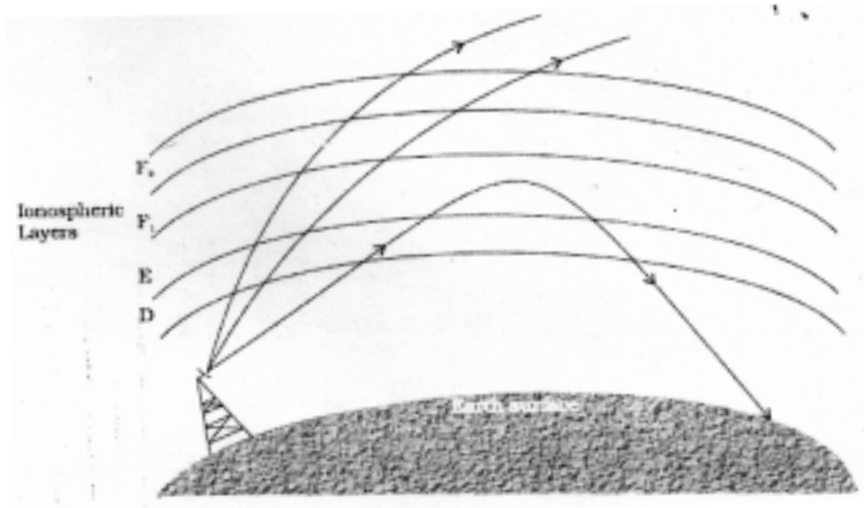
2

19.

Name of mode of propagation	$\frac{1}{2}$
Diagram + explanation	$\frac{1}{2} + 1$
Reason for upper limit	1

Sky wave propagation/ Ionospheric reflection

1/2



1/2

Electromagnetic waves of these frequencies are reflected, by the ionosphere towards the earth.

1

Electromagnetic waves of frequencies higher than 30 MHz penetrate the ionosphere and escape.

1

3

20.

Two factors:	1/2+1/2
Calculation of internal resistance:	2

- (i) Nature of electrolyte.
- (ii) Temperature of electrolyte.
- (iii) Area of electrode
- (iv) Concentration of electrolyte.
- (v) Distance of separation between the electrodes

(Any two)

2x1/2

Calculation of internal resistance:

Given  $E = 2.2 \text{ V}$  ;  $R = 5 \Omega$  and  $V = 1.8 \text{ V}$

1/2

$$\therefore I = \frac{V}{R} = \frac{1.8}{5} = 0.36$$

1/2

$$V = E - Ir$$

$$\Rightarrow r = \frac{E - V}{I} = \frac{2.2 - 1.8}{0.36} = \frac{0.4}{0.36} = 1.1 \Omega$$

1/2+1/2



Alternatively:

$$r = \left( \frac{E - V}{V} \right) \times R$$

$$= \left( \frac{2.2 - 1.8}{1.8} \right) \times 5$$

$$= 1.1 \Omega$$

1  
 $\frac{1}{2}$   
 $\frac{1}{2}$       3

21.

Calculation of	
(a) Equivalent capacitance	1½
(b) Charge on each capacitor	1½

(a)

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$

$$\frac{1}{C} = \frac{1}{12} + \frac{1}{12} + \frac{1}{12} = \frac{1}{4}$$

$\frac{1}{2}$

$$C = 4\mu\text{F} \text{ or simply } C_s = \frac{C}{3} = \frac{13}{3} \mu\text{F} = 4\mu\text{F}$$

$\frac{1}{2}$

Equivalent capacitance

$$C_{eq} = C + C_4 = 4 + 12 = 16\mu\text{F}$$

$\frac{1}{2}$

(b) Calculation of charge on each capacitor :

Charge on capacitor  $C_4$

$$Q_4 = C_4 V = 12 \times 500\mu\text{C} = 6000\mu\text{C} = 6 \times 10^{-3}\text{C}$$

$\frac{1}{2}$

Charge on capacitors  $C_1$ ,  $C_2$  and  $C_3$

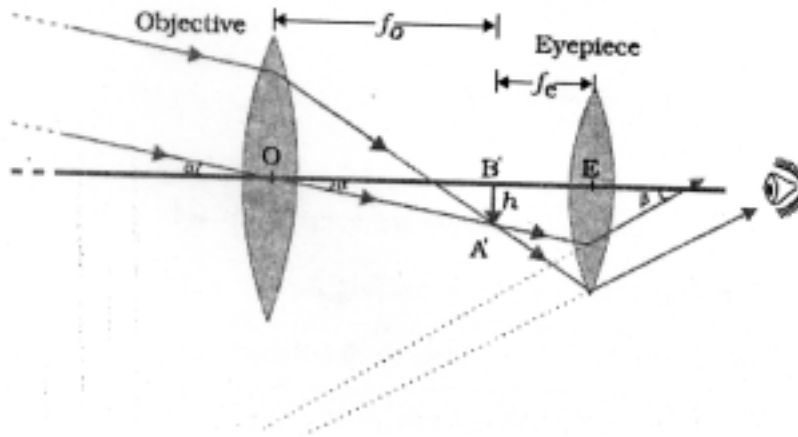
$$Q_{123} = 4\mu\text{F} \times 500\text{V} = 2 \times 10^{-3}\text{C}$$

$\frac{1}{2} + \frac{1}{2}$

3

22.

Labelled ray diagram in normal adjustment	$\frac{1}{2} + 1$
Brief working	$\frac{1}{2}$
Calculation of magnifying power	1



1½

(Deduct ½ mark if labelling is not done or arrows are not show.)

Light from a distant object enters the objective and a real image is formed in the tube at its second focal point. The eyepiece magnifies this image producing a final inverted image at infinity.

½

**Calculation of magnifying power:**

Given: Power of eyepiece = 10 D

Power of objective = 1 D

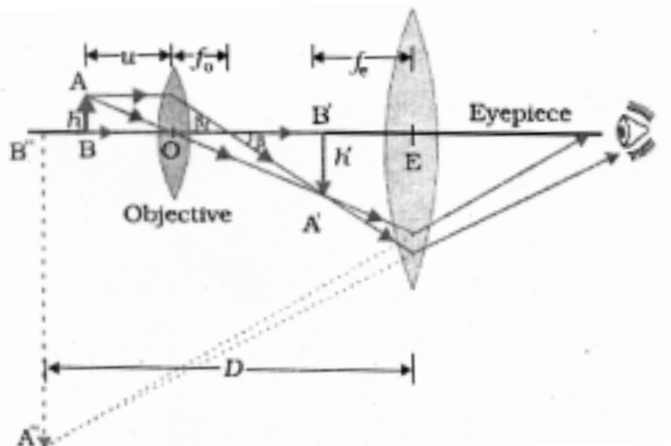
$$\frac{f_o}{f_e} = \frac{p_e}{p_o} = \frac{10}{1} = 10$$

Magnifying power in normal adjustment :  $m = \frac{f_o}{f_e} = \frac{p_e}{p_o} = 10$

½+½

**OR**

Labelled ray diagram of compound microscope	½+1
Working in brief	½
Reason	1



½

(Deduct ½ mark if labelling is not done or arrows are not shown.)

The **objective** forms a real, inverted, magnified image of the object. This serves as the object for the second lens, the **eyepiece**, which functions essentially like a simple microscope or magnifier, produces the final image, which is enlarged and virtual.

½

To achieve a large magnification of a **small** object; both the objective and eyepiece should have small focal lengths.

1

3

23.

Calculation of distance of second bright and dark fringe	2
Effect on fringe Pattern	1

Distance of  $n^{\text{th}}$  maxima from central maxima

$$x_n = \frac{n\lambda D}{d}$$

½

Given:  $n = 2$ ,  $d = 0.15 \text{ mm}$ ,  $\lambda = 450 \text{ nm}$  and  $D = 1.0 \text{ m}$

$$x_2 = \frac{2 \times 450 \times 10^{-9} \times 1.0}{0.15 \times 10^{-3}} = 6 \times 10^{-3} \text{ m} = 6 \text{ mm}$$

½

Distance of  $n^{\text{th}}$  minima from central maxima

$$y_2 = \frac{(2n-1)\lambda D}{2d} = \frac{(2 \times 2 - 1) 450 \times 10^{-9} \times 1}{2 \times 0.15 \times 10^{-3}} = 4.5 \times 10^{-3} \text{ m} = 4.5 \text{ mm}$$

½+½

When the screen is moved away from the slits fringes become farther apart. (Fringe width  $\propto$  distance of screen.)

1

3

24.

Statement of Kirchoff's rules	½+1
Equations for currents	½+½+½

(a) Junction rule: At any junction, the sum of the currents entering the junction is equal to the sum of currents leaving the junction.

½

(b) Loop rule: The algebraic sum of changes in potential, around any closed loop, involving resistors and cells in the loop, is zero.

1

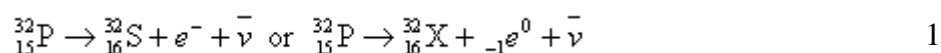
Expressions for the currents  $I_1, I_2$  and  $I_3$  using given loop.

- (i)  $I_3 = I_2 + I_1$  1/2
- (ii)  $4I_1 - 3I_2 + 1 = 0$  1/2
- (iii)  $3I_2 + 2I_3 - 3 = 0$  1/2 3

(Accept the equations if all the sign of the terms are taken in opposite order.)

25.	Decay process	1
	Derivation of average life	1
	Relationship with half life	1

$\beta^-$  decay process



Derivation of average life:

$$\tau = \frac{\lambda N_0 \int_0^{\infty} t e^{-\lambda t} dt}{N_0} = \lambda \int_0^{\infty} t e^{-\lambda t} dt \quad 1/2$$

$$\Rightarrow \tau = 1/\lambda \quad 1/2$$

Relation of average life with half life :

$$T_{1/2} = \frac{\ln 2}{\lambda} = \tau \ln 2 \quad 1 \quad 3$$

26.	Explanation of polarization of unpolarised light	1
	Expression for the intensity	1
	Orientation corresponding to minimum and maximum intensity	1

A polaroid consists of long chain molecules aligned in a particular direction. The electric vectors (associated with the propagating light wave) along the direction of the aligned molecules get absorbed. Thus, if an unpolarised light wave is incident on such a polaroid, then the light wave will get linearly polarised with the electric vector oscillating along a direction perpendicular to the aligned molecules.

1

(Give full credit if student explains it through a diagram)

**Expression for the intensity transmitted through second Polaroid :**

$$I = (I_0 \cos^2 \theta) \cos^2(90^\circ - \theta) = I_0 (\cos \theta \sin \theta)^2 = I_0 \sin^2 2\theta / 4$$

1

where  $I_0$  is the intensity of the polarized light after passing through the first polaroid.

Intensity will be maximum when  $\theta = 45^\circ$  and minimum when  $\theta = 0^\circ$

$\frac{1}{2} + \frac{1}{2}$

3

27.

Calculation of focal length	$2\frac{1}{2}$
Nature of lens	$\frac{1}{2}$

for real image  $m = -2 = \frac{v}{u} \Rightarrow v = -2u$

$\frac{1}{2}$

given  $|u| + |v| = 90 \text{ cm}$

$\frac{1}{2}$

$\Rightarrow 3|u| = 90 \text{ cm}$

$\Rightarrow |u| = 30 \text{ cm}$

$\frac{1}{2}$

We have for a lens

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\therefore \frac{1}{f} = \frac{1}{60} - \frac{1}{-30}$$

$\frac{1}{2}$

$$\frac{1}{f} = \frac{1}{20}$$

$\Rightarrow f = 20 \text{ cm}$

$\frac{1}{2}$

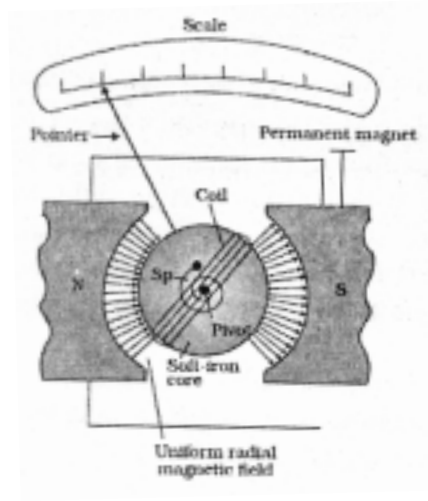
Nature of lens : Convex / Converging

$\frac{1}{2}$

3

28.

(a) Diagram ,principle and working	1+1+1
(b) Importance and production of radial magnetic field	½+½
(c) Reason	½+½



1

**Principle:** Torque acts on the current carrying loop when placed in magnetic field. ( $\tau = NIAB \sin\theta$ .)

1

**Working:** The magnetic torque tends to rotate the coil. A spring provides a counter torque that balances the magnetic torque; resulting in a steady angular deflection. The deflection is indicated on the scale by a pointer attached to the spring.

1

**Importance and production of radial magnetic field:**

In a radial magnetic field magnetic torque remains maximum for all positions of the coils.

½+½

It is produced due to cylindrical pole pieces and soft iron core.

**Reason:**

**Voltmeter:** This ensures that a very low current passes through the voltmeter and hence does not change (much) the original potential difference to be measured.

½

**Ammeter:** This ensures that the total resistance of the circuit does not change much and the current flowing remains (almost) at its original value.

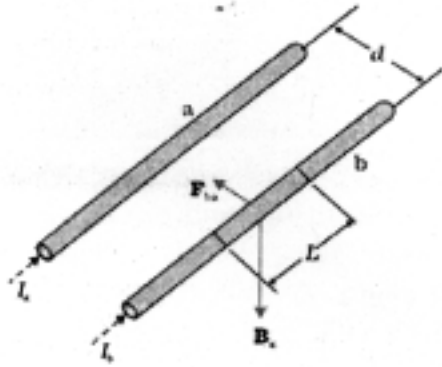
½

5

**OR**

(a)	Derivation of expression of force	2½
(b)	Definition of SI unit of current	1
(c)	Calculation of force (magnitude and direction)	1+½

(a)



½

Two long parallel conductors 'a' and 'b' are separated by a distance  $d$  and carry (parallel) currents  $I_a$  and  $I_b$ , respectively. The conductor 'a' produces, the same magnetic field  $\mathbf{B}_a$  at all points along the conductor 'b'.

1

$$B_a = \frac{\mu_0 I_a}{2\pi d}$$

$\mathbf{F}_{ba}$ , is the force on a segment  $L$  of 'b' due to 'a'. The magnitude of this force is given by

½

$$F_{ba} = I_b L B_a$$

½

$$= \frac{\mu_0 I_a I_b}{2\pi d} L$$

(b) The ampere is the value of that steady current which, when maintained in each of the two very long, straight, parallel conductors of negligible cross-section, and placed one metre apart in vacuum, would produce on each of these conductors a force equal to  $2 \times 10^{-7}$  newton per metre of length.

1

(c) Magnetic field due to the straight wire AB at a perpendicular distance  $d$  from it.

½

$$B = \frac{\mu_0 I}{2\pi d}$$

Therefore, force on proton moving with velocity 'v' perpendicular to B, is

$$f = qvB = \frac{\mu_0 I q v}{2\pi d} \quad 1$$

Direction : Towards right 1/2      5

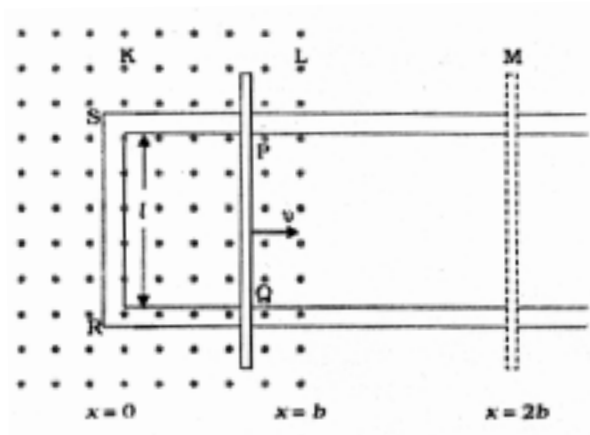
29.	Faraday's law of electromagnetic induction	1
	Expression for flux and induced emf	1+1
	Sketch of the variation of these quantities with distance	1+1

The magnitude of the induced emf in a circuit is equal to the time rate of change of magnetic flux through the circuit. 1

Alternatively

Mathematically, the induced emf is given by

$$e = \frac{-d\phi}{dt}$$



First consider the forward motion from  $x = 0$  to  $x = 2b$

The flux  $\phi_B$  linked with the circuit SPQR is

$$\phi_B = Blx \quad 0 \leq x < b \quad 1/2$$

$$= Blb \quad b \leq x < 2b \quad 1/2$$

The induced emf is



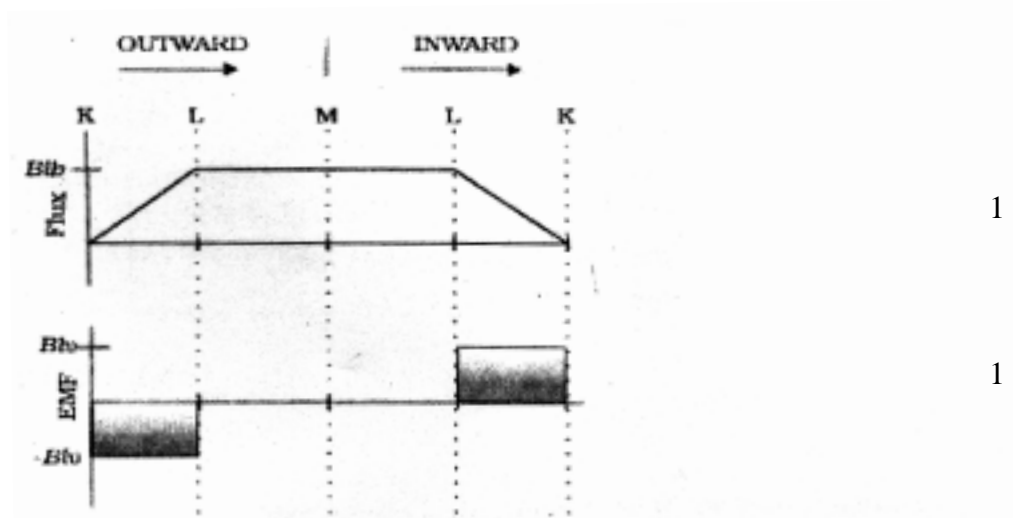
$$\varepsilon = \frac{d\phi_B}{dt}$$

$$= -Blu \quad 0 \leq x < b$$

1/2

$$= 0 \quad b \leq x < 2b$$

1/2



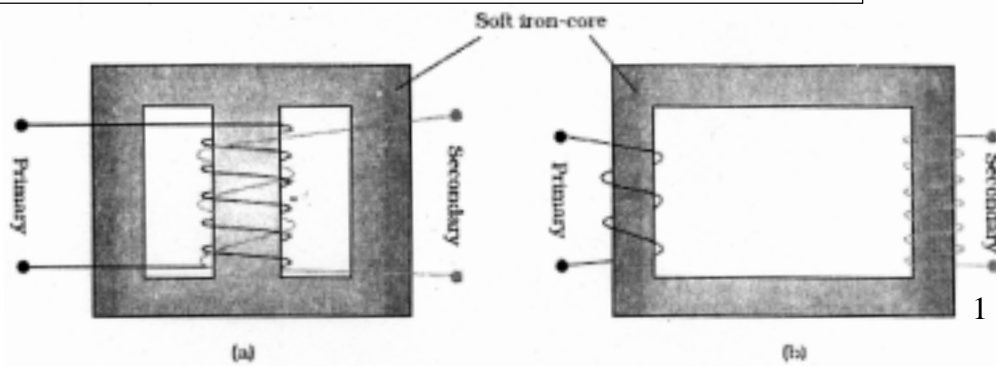
1

1

5

OR

Schematic diagram	1
Working principle	1
Derivation	1½
Ratio of currents	½
Distribution of energy over long distance	1



1

(Any one of the above diagrams)

**Principle:** When an alternating voltage is applied to the primary, the resulting current produces an alternating magnetic flux which links the secondary and induces an emf in it (mutual induction).

1

**Derivation:**

The induced emf or voltage  $e_s$ , in the secondary, with  $N_s$  turns, is 1/2

$$e_s = \frac{-N_s d\phi}{dt}$$

The alternating flux  $\phi$  also induces an emf, called back emf, in the primary.  
This is

$$e_p = \frac{-N_p d\phi}{dt}$$

But  $e_s = v_s$  and  $e_p = v_p$

therefore

$$v_s = \frac{-N_s d\phi}{dt} \quad \text{and} \quad v_p = \frac{-N_p d\phi}{dt} \quad \text{1/2}$$

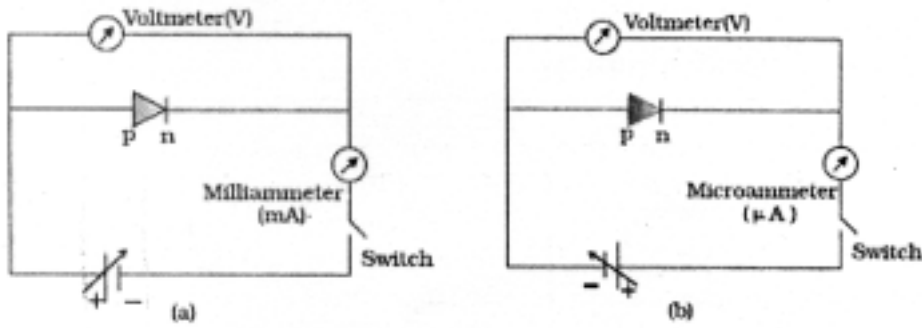
$$\text{Hence } \frac{v_s}{v_p} = \frac{N_s}{N_p} \quad \text{1/2}$$

If the transformer is assumed to be 100% efficient (no energy losses), the power input is equal to the power output, and since  $p = i v$ ,  $i_p v_p = i_s v_s$ . then

$$\frac{v_s}{v_p} = \frac{N_s}{N_p} = \frac{i_p}{i_s} \quad \text{1/2}$$

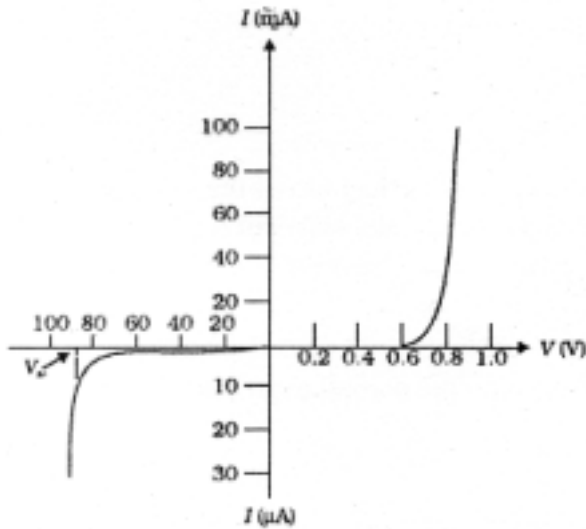
The large scale transmission and distribution of electrical energy over long distances is done with the use of transformers. The voltage output of the generator is stepped-up (so that current is reduced and consequently, the  $I^2R$  loss is cut down). It is then transmitted over long distances to an area sub-station near the consumers. There the voltage is stepped down. It is further stepped down at distributing sub-stations and utility poles before a power supply of 240 V reaches our homes. 1                      5

30.	(a) Circuit diagram	1+1
	Typical V-I characteristics	1/2+1/2
	(b) LED; two important advantages	1+1/2+1/2



1+1

The battery is connected to the diode through a potentiometer (or rheostat) so that the applied voltage to the diode can be changed. For different values of voltages, the value of the current is noted. A graph between  $V$  and  $I$  is obtained. Note that in forward bias measurement, we use a milliammeter (since the expected current is large) while a microammeter is used in reverse bias.



1/2+1/2

Typical  $V$ - $I$  characteristics of a silicon diode.

### Light emitting diode

It is a heavily doped p-n junction which under forward bias emits spontaneous radiation. / p-n junction diode which emits light when forwardly biased.

1

Advantages:

- (i) Low operational voltage and less power.
- (ii) Fast action and no warm-up time required.

- (iii) The bandwidth of emitted light is  $100 \text{ \AA}$  to  $500 \text{ \AA}$ , or in other words it is nearly (but not exactly) monochromatic.
- (iv) Long life and ruggedness.
- (v) Fast on-off switching capability

(Any two)

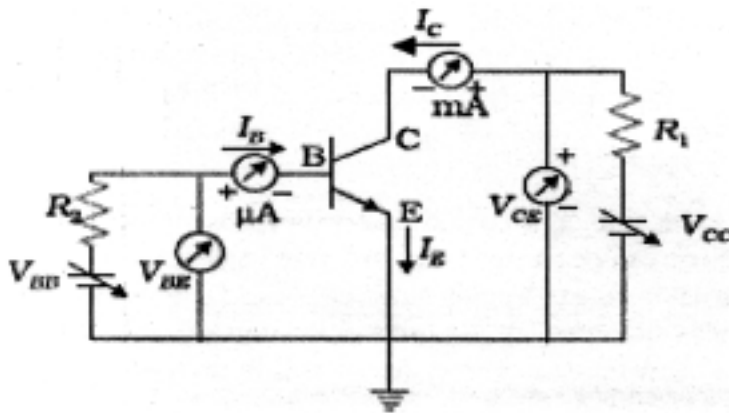
$\frac{1}{2} + \frac{1}{2}$

5

**OR**

(a)	Circuit diagram for transistor characteristics	2
	Definitions	$\frac{1}{2} + \frac{1}{2}$
(b)	Circuit diagram	1
	Explanation of self sustained oscillations	1

(a)



2

- (i) **Input resistance:** This is defined as the ratio of change in base emitter voltage ( $\Delta V_{BE}$ ) to the resulting change in base current ( $\Delta I_B$ ) at constant collector-emitter voltage ( $V_{CE}$ ).

$$r_i = \left( \frac{\Delta V_{BE}}{\Delta I_B} \right)_{V_{CE}}$$

$\frac{1}{2}$

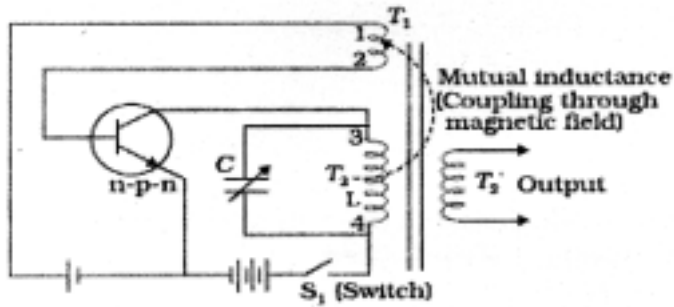
- (ii) **Current amplification factor ( $\beta$ ):** This is defined as the ratio of the change in collector current to the change in base current at a constant collector-emitter voltage ( $V_{CE}$ ) when the transistor is in active state.

$$\beta_{ac} = \left( \frac{\Delta I_C}{\Delta I_B} \right)_{V_{CE}}$$

1/2

(Give each of these marks if student writes only the correct expressions.)

(b) **Circuit diagram:**

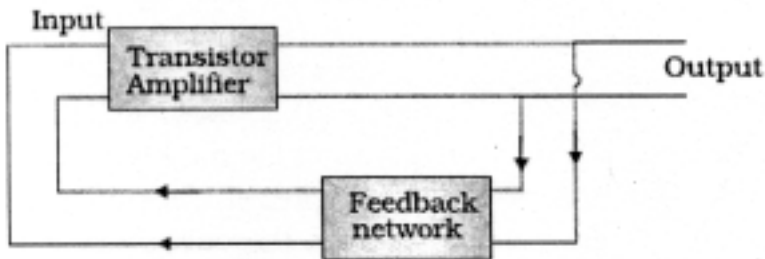


1

**Working:** In an oscillator, we get an ac output without any external input signal. Hence, the output in an oscillator is self-sustained. To attain this, an amplifier is taken. A portion of the output power is returned back (feedback) to the input in phase with the starting power (this process is termed positive feedback).

5

[Give 1/2 mark if student just draws the block diagram.]



# CHEMISTRY (Theory)

*Time allowed : 3 hours*

*Maximum Marks : 70*

## **General Instructions:**

- (i) *All questions are compulsory.*
- (ii) *Marks for each question are indicated against it.*
- (iii) *Question numbers 1 to 8 are very short-answer questions and carry 1 mark each.*
- (iv) *Question numbers 9 to 18 are short-answer questions and carry 2 marks each.*
- (v) *Question numbers 19 to 27 are also short-answer questions and carry 3 marks each.*
- (vi) *Question numbers 28 to 30 are long-answer questions and carry 5 marks each.*
- (vii) *Use Log Tables, if necessary, Use of calculators is **not** allowed.*

## **QUESTION PAPER CODE 56/1/1**

- |    |   |   |
|----|---|---|
| 1. | Write a feature which will distinguish a metallic solid from an ionic solid.  | 1 |
| 2. | Define 'order of a reaction'.   | 1 |
| 3. | What is an emulsion?  | 1 |
| 4. | Why does NO <sub>2</sub> dimerise ?   | 1 |
| 5. | Give an example of linkage isomerism.   | 1 |
| 6. | A solution of KOH hydrolyses CH <sub>3</sub> CHClCH <sub>2</sub> CH <sub>3</sub> and CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> Cl.<br>Which one of these is more easily hydrolysed? | 1 |
| 7. | Draw the structural formula of I-phenylpropan-1-one molecule.   | 1 |
| 8. | Give the IUPAC name of H <sub>2</sub> N – CH <sub>2</sub> – CH <sub>2</sub> - CH = CH <sub>2</sub> .  | 1 |

9. Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type. 2
10. A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when (i) the concentration of B alone is increased to three times (ii) the concentrations of A as well as B are doubled? 2
11. The rate constant for a reaction of zero order in A is  $0.0030 \text{ mol L}^{-1} \text{ s}^{-1}$ . How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M? 2
12. Draw the structures of white phosphorus and red phosphorus. Which one of these two types of phosphorus is more reactive and why? 2
13. Explain the following observations:
- (i) Generally there is an increase in density of elements from titanium ( $Z = 22$ ) to copper ( $Z = 29$ ) in the first series of transition elements.
  - (ii) Transition elements and their compounds are generally found to be good catalysts in chemical reactions. 2
14. Name the following coordination compounds according to IUPAC system of nomenclature:
- (i)  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$
  - (ii)  $[\text{CrCl}_2(\text{en})_2]\text{Cl}$ , (en = ethane – 1, 2 – diamine) 2
15. Illustrate the following reactions giving a chemical equation for each:
- (i) Kolbe's reaction,
  - (ii) Williamson synthesis. 2
16. How are the following conversions carried out?
- (i) Benzyl chloride to benzyl alcohol,
  - (ii) Methyl magnesium bromide to 2-methylpropan-2-ol. 2

17. Explain the following terms. :

- (i) Invert sugar
- (ii) Polypeptides

**OR**

Name the products of hydrolysis of sucrose. Why is sucrose not a reducing sugar? 2

18. What are essential and non-essential amino acids in human food? Give one example of each type. 2

19. The well known mineral fluorite is chemically calcium fluoride. It is known that in one unit cell of this mineral there are 4  $\text{Ca}^{2+}$  ions and 8  $\text{F}^-$  ions and that  $\text{Ca}^{2+}$  ions are arranged in a fcc lattice. The  $\text{F}^-$  ions fill all the tetrahedral holes in the face centred cubic lattice of  $\text{Ca}^{2+}$  ions. The edge of the unit cell is  $5.46 \times 10^{-8}$  cm in length. The density of the solid is  $3.18 \text{ g cm}^{-3}$ . Use this information to calculate Avogadro's number (Molar mass of  $\text{CaF}_2 = 78.08 \text{ g mol}^{-1}$ ) 3

20. A solution prepared by dissolving 1.25 g of oil of winter green (methyl salicylate) in 99.0 g of benzene has a boiling point of  $80.31^\circ\text{C}$ . Determine the molar mass of this compound. (B.P. of pure benzene =  $80.10^\circ\text{C}$  and  $K_b$  for benzene =  $2.53^\circ\text{C kg mol}^{-1}$ ) 3

21. What is the difference between multi molecular and macromolecular colloids? Give one example of each type. How are associated colloids different from these two types of colloids? 3

22. Describe how the following changes are brought about:

- (i) Pig iron into steel.
- (ii) Zinc oxide into metallic zinc.
- (iii) Impure titanium into pure titanium. 3

**OR**

Describe the role of

- (i)  $\text{NaCN}$  in the extraction of gold from gold ore.



- (ii)  $\text{SiO}_2$  in the extraction of copper from copper matte.
- (iii) Iodine in the refining of zirconium.

Write chemical equations for the involved reactions.

23. How would you account for the following?

- (i) The atomic radii of the metals of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second (4d) series.
- (ii) The  $E^\circ$  value for the  $\text{Mn}^{3+}/\text{Mn}^{2+}$  couple is much more positive than that for  $\text{Cr}^{3+}/\text{Cr}^{2+}$  couple or  $\text{Fe}^{3+}/\text{Fe}^{2+}$  couple.
- (iii) The highest oxidation state of a metal is exhibited in its oxide or fluoride. 3

24. (i) State one use each of DDT and iodoform.

- (ii) Which compound in the following couples will react faster in  $\text{S}_{\text{N}}2$  displacement and why?

(a) 1-Bromopentane or 2-bromopentane

(b) 1-Bromo-2-methylbutane or 2-bromo-2-methylbutane. 3

25. In the following cases rearrange the compounds as directed:

- (i) In an increasing order of basic strength:

$\text{C}_6\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$ ,  $(\text{C}_2\text{H}_5)_6\text{NH}$  and  $\text{CH}_3\text{NH}_2$

- (ii) In a decreasing order of basic strength:

Aniline, p-nitroaniline and p-toluidine

- (iii) In an increasing order of  $\text{pK}_\text{b}$  values:

$\text{C}_2\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NHCH}_3$ ,  $(\text{C}_2\text{H}_5)_2\text{NH}$  and  $\text{C}_6\text{H}_5\text{NH}_2$  3

26. Give one example each of
- addition polymers,
  - condensation polymers,
  - copolymers.

3

27. What are analgesic medicines? How are they classified and when are they commonly recommended for use?

3

28. (a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law.

- (b) Calculate  $\Lambda_m^\circ$  for acetic acid.

Given that  $\Lambda_m^\circ(\text{HCl}) = 426 \text{ S cm}^2 \text{ mol}^{-1}$

$$\Lambda_m^\circ(\text{NaCl}) = 126 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\Lambda_m^\circ(\text{CH}_3\text{COONa}) = 91 \text{ S cm}^2 \text{ mol}^{-1}$$

5

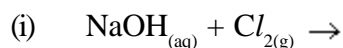
**OR**

- (a) Write the anode and cathode reactions and the overall reaction occurring in a lead storage battery.

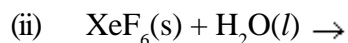
- (b) A copper-silver cell is set up. The copper ion concentration is 0.10 M. The concentration of silver ion is not known. The cell potential when measured was 0.422 V. Determine the concentration of silver ions in the cell. (Given  $E_{\text{Ag}^+/\text{Ag}}^\circ = +0.80 \text{ V}$ ,  $E_{\text{Cu}^{2+}/\text{Cu}}^\circ = +0.34 \text{ V}$ )

5

29. (a) Complete the following chemical equations:



(Hot and cone.)



- (b) How would you account for the following?
- (i) The value of electron gain enthalpy with negative sign for sulphur is higher than that for oxygen.
  - (ii)  $\text{NF}_3$  is an exothermic compound but  $\text{NCl}_3$  is endothermic compound.
  - (iii)  $\text{CF}_3$  molecule has a T-shaped structure and not a trigonal planar one. 5

**OR**

- (a) Complete the following chemical reaction equations:
- (i)  $\text{P}_4 + \text{SO}_2\text{Cl}_2 \rightarrow$
  - (ii)  $\text{XeF}_4 + \text{H}_2\text{O} \rightarrow$
- (b) Explain the following observations giving appropriate reasons:
- (i) The stability of +5 oxidation state decreases down the group in group 15 of the periodic table.
  - (ii) Solid phosphorus pentachloride behaves as an ionic compound.
  - (iii) Halogens are strong oxidizing agents. 5
30. (a) Explain the mechanism of a nucleophilic attack on the carbonyl group of an aldehyde or a ketone.
- (b) An organic compound (A) (molecular formula  $\text{C}_8\text{H}_{16}\text{O}_2$ ) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid also produced (B). On dehydration (C) gives but-1-ene. Write the equations for the reactions involved. 5

**OR**

- (a) Give chemical tests to distinguish between the following pairs of compounds:
- (i) Ethanal and Propanal
  - (ii) Phenol and Benzoic acid

(b) How will you bring about the following conversions? 5

(i) Benzoic acid to benzaldehyde

(ii) Ethanal to but-2-enal

(iii) Propanone to propene

Give complete reaction in each case.

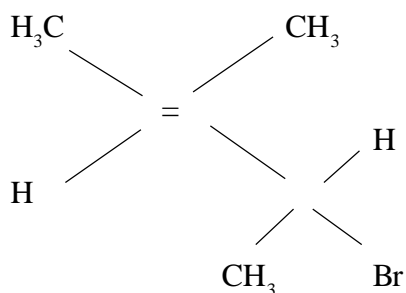
### QUESTION PAPER CODE 56/1

1. What type of interactions hold the molecules together in a polar molecular solid? 1

2. What is meant by 'limiting molar conductivity' ? 1

3. Fluorine does not exhibit any positive oxidation state. Why? 1

4. Give the IUPAC name of the following compound: 1



5. Write the structure of the molecule of a compound whose IUPAC name is  
I-phenylpropan-2-ol 1

6. What is Tollen's reagent? Write one usefulness of this reagent. 1

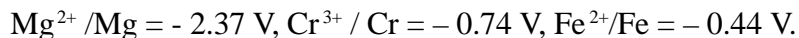
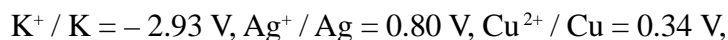
7. What is meant by 'reducing sugars' ? 1

8. What does the designation '6,6' mean in the name nylon-6, 6 ? 1

9. Define the terms, 'osmosis' and 'osmotic pressure'. What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar masses of solutes in solutions? 2

10. Express the relation among the cell constant, the resistance of the solution in the cell and the conductivity of the solution. How is the conductivity of a solution related to its molar conductivity? 2

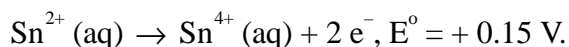
11. Given that the standard electrode potentials ( $E^{\circ}$ ) of metals are:



Arrange these metals in an increasing order of their reducing power. 2

OR

Two half-reactions of an electrochemical cell are given below:



Construct the redox reaction equation from the two half-reactions and calculate the cell potential from the standard potentials and predict if the reaction is reactant or product favoured. 2

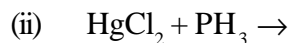
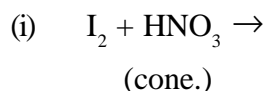
12. Describe the following: 2

(i) Tyndall effect

(ii) Shape-selective catalysis

13. What is meant by coagulation of a colloidal solution? Name any method by which coagulation of lyophobic sols can be carried out. 2

14. Complete the following, chemical reaction equations: 2



15. Draw the structural formulae of the following compounds: 2
- (i)  $\text{H}_4\text{P}_2\text{O}_5$
- (ii)  $\text{XeF}_4$
16. Give the chemical tests to distinguish between the following pairs of compounds: 2
- (i) Ethylamine and Aniline
- (ii) Aniline and Benzylamine
17. Identify A and B in each of the following processes : 2
- (i)  $\text{CH}_3\text{CH}_2\text{Cl} \xrightarrow{\text{NaCN}} \text{A} \xrightarrow[\text{Ni}/\text{H}_2]{\text{reduction}} \text{B}$
- (ii)  $\text{C}_6\text{H}_5\text{NH}_2 \xrightarrow{\text{NaNO}_2/\text{HCl}} \text{A} \xrightarrow[\text{OH}^-]{\text{C}_6\text{H}_5\text{NH}_2} \text{B}$
18. Draw the molecular structures of the monomers of 2
- (i) PVC
- (ii) Teflon
19. The density of copper metal is  $8.95 \text{ g cm}^{-3}$ . If the radius of copper atom be  $127.8 \text{ pm}$ , is the copper unit cell simple cubic, body-centred cubic or face-centred cubic? 3  
(Given: atomic mass of Cu =  $63.54 \text{ g mol}^{-1}$  and  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ )
20. What mass of NaCl (molar mass =  $58.5 \text{ g mol}^{-1}$ ) must be dissolved in  $65 \text{ g}$  of water to lower the freezing point by  $7.50^\circ\text{C}$ ? The freezing point depression constant,  $K_f$ , for water is  $1.86 \text{ K kg mol}^{-1}$ . Assume van't Hoff factor for NaCl is  $1.87$ . 3
21. Describe the role of the following: 3
- (i) NaCN in the extraction of silver from a silver ore
- (ii) Iodine in the refining of titanium
- (iii) Cryolite in the metallurgy of aluminium

**OR**

Describe the principle involved in each of the following processes of metallurgy :

- (i) Froth floatation method
  - (ii) Electrolytic refining of metals
  - (iii) Zone refining of metals
22. Explain the following cases giving appropriate reasons: 3
- (i) Nickel does not form low spin octahedral complexes.
  - (ii) The  $\pi$ -complexes are known for the transition metals only.
  - (iii)  $\text{Co}^{2+}$  is easily oxidised to  $\text{Co}^{3+}$  in the presence of a strong ligand.
23. How would you differentiate between  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}2$  mechanisms of substitution reactions? Give one example of each. 3
24. How would you convert the following: 3
- (i) Phenol to benzoquinone
  - (ii) Propanone to 2-methylpropan-2-ol
  - (iii) Propene to propan-2-ol
25. How would you account for the following: 3
- (i)  $\text{NCl}_3$  is an endothermic compound while  $\text{NF}_3$  is an exothermic one.
  - (ii)  $\text{XeF}_2$  is a linear molecule without a bend.
  - (iii) The electron gain enthalpy with negative sign for fluorine is less than that for chlorine, still fluorine is a stronger oxidising agent than chlorine.
26. Amino acids may be acidic, alkaline or neutral. How does this happen? What are essential and non-essential amino acids? Name one of each type. 3

27. Explain the following terms with one example in each case:

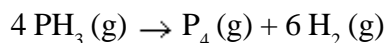
3

- (i) Food preservatives
- (ii) Enzymes
- (iii) Detergents

28. (a) Explain the following terms:

- (i) Rate of a reaction
- (ii) Activation energy of a reaction

(b) The decomposition of phosphine,  $\text{PH}_3$ , proceeds according to the following equation:



It is found that the reaction follows the following rate equation:

$$\text{Rate} = k [\text{PH}_3].$$

The half-life of  $\text{PH}_3$  is 37.9 s at  $120^\circ \text{C}$ .

- (i) How much time is required for 3/4th of  $\text{PH}_3$  to decompose?
- (ii) What fraction of the original sample of  $\text{PH}_3$  remains behind after 1 minute?

5

**OR**

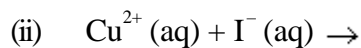
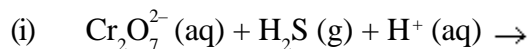
(a) Explain the following terms:

- (i) Order of a reaction
- (ii) Molecularity of a reaction

(b) The rate of a reaction increases four times when the temperature changes from 300 K to 320 K. Calculate the energy of activation of the reaction, assuming that it does not change with temperature. ( $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )



29. (a) Complete the following chemical equations:



(b) How would you account for the following:

(i) The oxidising power of oxoanions are in the order  $\text{VO}_2^+ < \text{Cr}_2\text{O}_7^{2-} < \text{MnO}_4^-$ .

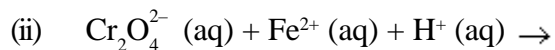
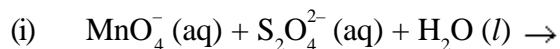
(ii) The third ionization enthalpy of manganese ( $Z = 25$ ) is exceptionally high.

(iii)  $\text{Cr}^{2+}$  is a stronger reducing agent than  $\text{Fe}^{2+}$ .

5

**OR**

(a) Complete the following chemical equations:



(b) Explain the following observations:

(i)  $\text{La}^{3+}$  ( $Z = 57$ ) and  $\text{Lu}^{3+}$  ( $Z = 71$ ) do not show any colour in solutions.

(ii) Among the divalent cations in the first series of transition elements, manganese exhibits the maximum paramagnetism.

(iii)  $\text{Cu}^+$  ion is not known in aqueous solutions.

30. (a) Illustrate the following name reactions giving a chemical equation in each case:

(i) Clemmensen reaction

(ii) Cannizzaro's reaction

(b) Describe how the following conversions can be brought about:

(i) Cyclohexanol to cyclohexan-1-one

(ii) Ethylbenzene to benzoic acid

(iii) Bromobenzene to benzoic acid

5

**OR**

(a) Illustrate the following name reactions:

(i) Hell - Volhard - Zelinsky reaction

(ii) Wolff - Kishner reduction reaction

(b) How are the following conversions carried out:

(i) Ethylcyanide to ethanoic acid

(ii) Butan-1-ol to butanoic acid

(iii) Methylbenzene to benzoic acid

Write chemical equations for the involved reactions.

## Marking Scheme ó Chemistry

### *General Instructions*

1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the same meaning, such answers should be given full weightage.
2. The Marking Scheme carries only suggested value point for the answers. These are only guidelines and do not constitute the complete answers. The students can have their own expression and if the expression is correct the marks, will be awarded accordingly.
3. Some of the questions may relate to higher order thinking ability. These questions have been indicated by the mark\* and the students understanding/analytical ability may be judged. These questions are to be evaluated carefully.
4. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been carried out as per the instruction given in the marking scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
5. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration - Marking Scheme should be strictly adhered to and religiously followed.
6. If a question has parts, please award marks in the right hand side for each part. Marks awarded for different parts of the question should then be totalled up and written in the left hand margin and circled.
7. If a question does not have any parts, marks be awarded in the left-hand margin.
8. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.
9. No Marks to be deducted for the cumulative effect of an error. It should be penalized only once.
10. A full scale of marks 0-70 has to be used. Please do not hesitate to award full marks if the answer deserves it.

QUESTION PAPER CODE 56/1/1

**EXPECTED ANSWERS/VALUE POINTS**

- |    |   |   |
|----|---|---|
| 1  | Mode of conduction, through electrons in solid metal and through ions in molten state or in solution in ionic solid / Metals are malleable and ductile whereas ionic solids are hard and brittle. | 1 |
| 2  | The sum of powers of the concentration of the reactants in the rate law expression is called the order of that chemical reaction.   | 1 |
| 3  | Emulsions are liquid-liquid colloidal systems.  | 1 |
| 4  | Because NO <sub>2</sub> contains odd number of valence electrons and on dimerisation it is converted to stable N <sub>2</sub> O <sub>4</sub> molecule with even number of electrons.              | 1 |
| 5  | [Co(NH <sub>3</sub> ) <sub>5</sub> (NO <sub>2</sub> )]Cl <sub>2</sub> and [Co(NH <sub>3</sub> ) <sub>5</sub> (ONO)]Cl <sub>2</sub> (or any other correct example)                                 | 1 |
| 6  | CH <sub>3</sub> CHCl CH <sub>2</sub> CH <sub>3</sub>  | 1 |
| 7  | Ph – CO – CH <sub>2</sub> -CH <sub>3</sub>  | 1 |
| 8  | But-3-en-1-amine  | 1 |
| 9  | When the vapour pressure of a non-ideal solution is either higher or lower than that predicted by Raoult's law, the solution exhibits deviations.   | ½ |
|    | These deviations are caused because of unequal intermolecular attractive forces between solute-solvent molecules and solute-solute or solvent-solvent molecules.                                  | ½ |
|    | Positive deviation eg: mixture of ethanol and acetone, carbon-disulphide and acetone (any one)  | ½ |
|    | Negative deviation eg: Chloroform and acetone, nitric acid and water (any one)  | ½ |
| 10 | Rate = k[A][B] <sup>2</sup>   |   |
|    | (i) When the concentration of B is increased to 3 times, then rate would be   |   |
|    | Rate = k[A][3B] <sup>2</sup>  | ½ |

$$= 9k[A][B]^2$$

**= 9 times the initial Rate<sub>1</sub> i.e. rate is increased 9 times** 1/2

(ii) When the concentration of A as well as B are doubled, then rate would be

$$\text{Rate} = k[2A][2B]^2 \quad \text{1/2}$$

$$= 8k[A][B]^2$$

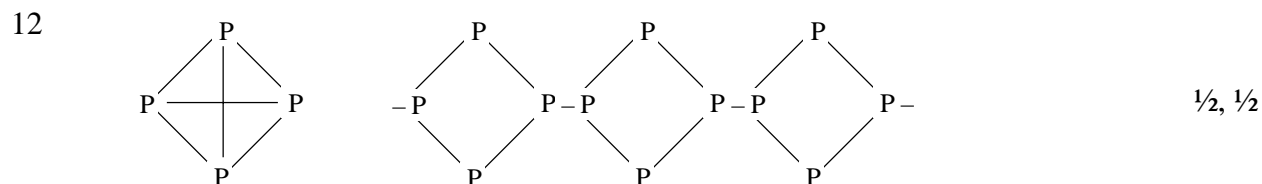
**= 8 times the initial Rate i.e. rate is increased 8 times** 1/2

11  $[R]_t = -kt + [R]_0$  1/2

$$0.075M = -(0.0030 \text{ mol L}^{-1} \text{ s}^{-1})t + 0.10M \quad \text{1/2}$$

$$-0.025M = -(0.0030 \text{ mol L}^{-1} \text{ s}^{-1})t$$

**t = 8.3s** 1



White Phosphorus

Rod Phosphorus

White phosphorus is more reactive due to its discrete tetrahedral structure and angular strain 1

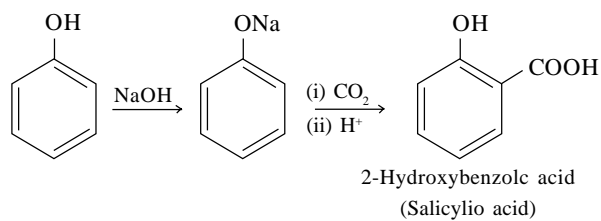
13 (i) Due to decrease in size and increasing mass.

(ii) Because of variable oxidation states exhibited by them. 1+1

14 (i) Tetraammineaquachloridocobalt(III) chloride

(ii) Dichloridobis(ethane-1,2-diamine)chromium(III) chloride 1+1

15 (i) Kolbe's Reaction



1

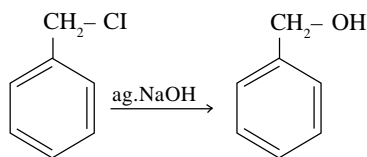
(ii) Williamson Synthesis



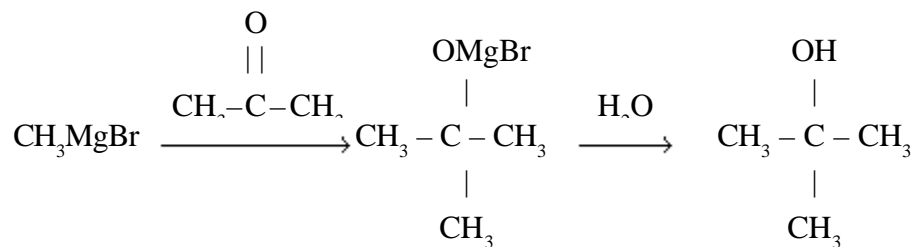
1

Where R and R' are alkyl groups.

16 (i)



(ii)



1

*(or any other suitable method)*

17 i) Invert sugar: Hydrolysis of sucrose brings about a change in a sign of rotation from dextro (+) to laevo (-) and the product is named as invert sugar

1

ii) Polypeptides are the polymers of amino acids.

1

OR

Products of hydrolysis of sucrose are : Glucose and Fructose

1

Because Carbonyl group of sucrose is not free

1

- 18 Amino acids which must be supplied in our diet are called Essential Amino Acids  
eg. Leucine, Isoleucine, Valine (any one) ½ + ½

Amino acids which can be made by our bodies and not required in our diet are called non-essential Amino Acids eg. Glycine, Alanine (any one) ½ + ½

19 
$$d = \frac{z \times M}{a^3 \times N_A}$$

For fcc lattice  $z = 4$  1

$$3.18 \text{ g cm}^{-3} = \frac{4 \times 78.08 \text{ g mol}^{-1}}{(5.46 \times 10^{-8} \text{ cm})^3 \times N_A}$$
 1

$$N_A = \frac{4 \times 78.08 \text{ g mol}^{-1}}{(5.46 \times 10^{-8} \text{ cm})^3 \times 3.18 \text{ g cm}^{-3}}$$

$N_A = 6.033 \times 10^{23} \text{ mol}^{-1}$  1

20  $\Delta T_b = (80.31 - 80.10)^\circ\text{C} = 0.21^\circ\text{C}$  or 0.21 K

$\Delta T_b = K_b m$  1

$$0.21^\circ\text{C} = 2.53^\circ\text{C kg mol}^{-1} \times \frac{1.25\text{g}}{M} \times \frac{1000}{99\text{kg}}$$
 1

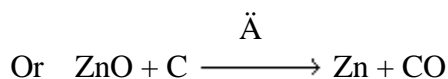
$M = 152 \text{ g mol}^{-1}$  1

Where M is molar mass of the solute

	Multimolecular colloids	Macromolecular colloids	
21	They are aggregates of molecules less than 1nm thick.	They themselves are large molecules of colloidal dimensions	½+½
	Example :Sulphur Sol	Example :Starch	½+½

Associated colloids – are those which at low concentration behave as normal electrolytes & at high concentration act as colloids. 1

- 22 i) Pig iron is converted into steel by adding carbon and some other elements.  
 ii) Metallic Zinc is obtained from Zinc oxide by reduction with coke.



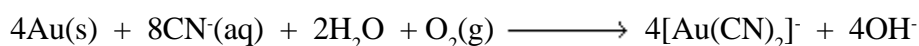
- iii) Impure titanium is heated with Iodine to form volatile complex  $\text{TiI}_4$  which on further heating to higher temperature decomposes to give pure titanium. 1x3 = 3

(or Chemical Equations to represent the above reactions)

OR

- (i) Role of NaCN in the extraction of gold is to do the leaching of gold ore in the presence of air from which the gold is obtained later by replacement. 1

or

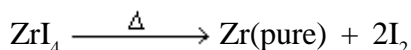
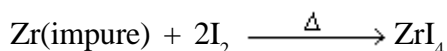


- (ii)  $\text{SiO}_2$  is added in copper matte to convert the remaining FeS, FeO to slag. 1

or



- (iii) Iodine is heated with Zirconium to form a volatile compound which on further heating decomposes to give pure zirconium as shown: 1



- 23 (i) Due to Lanthanoid Contraction / or its meaning  
 (ii) Due to stable half-filled  $3d^5$  configuration of  $\text{Mn}^{2+}$  / high  $3^{\text{rd}}$  ionisation enthalpy of Mn.  
 (iii) Because Oxygen or Fluorine is highly electronegative and small size element. 1x3 = 3
- 24 (i) DDT is used as an insecticide and Iodoform is used as a mild antiseptic.  $\frac{1}{2} + \frac{1}{2}$   
 (ii) (a) 1-Bromo pentane, as it is a primary alkyl halide.  $\frac{1}{2} + \frac{1}{2}$   
 (b) 1-Bromo-2-methyl butane, as it is a primary alkyl halide.  $\frac{1}{2} + \frac{1}{2}$



- 25 (i)  $C_6H_5NH_2 < C_6H_5N(CH_3)_2 < CH_3NH_2 < (C_2H_5)_2NH$
- (ii) p-toluidine > Aniline > p-nitroaniline
- (iii)  $(C_2H_5)_2NH < C_2H_5NH_2 < C_6H_5NHCH_3 < C_6H_5NH_2$  1x3 = 3

- 26 (i) Polythene, PVC, (or any other one example)
- (ii) Nylon-6,6, Nylon-6, Terylene (or any other one example)
- (iii) Buna-S, Buna-N (or any other one example) 1x3 = 3

27 The chemical substances which are used to relieve pain. 1

These are of two types: (i) Non narcotic Drugs

(ii) Narcotic Drugs 1

Non Narcotic Drugs are effective in relieving skeletal pain / preventing heart attack / viral inflammation, etc. 1/2

Narcotic Drugs are recommended for the relief in postoperative pains / Cardiac pain / terminal cancer. 1/2

- 28 (i) The law states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the Anion and Cation of the electrolyte. 1

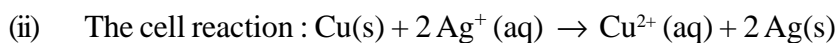
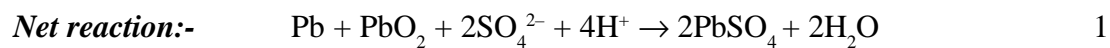
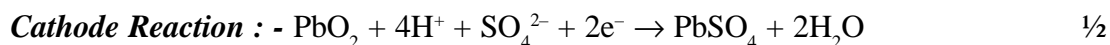
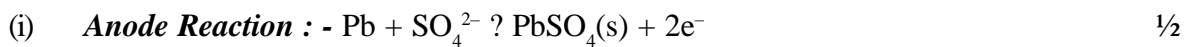
$$\overset{\circ}{E}_{m(HAc)} = \overset{\circ}{e}_{H^+} + \overset{\circ}{e}_{Ac^-} \quad 1$$

(ii)  $\overset{\circ}{CH_3COOH} = \overset{\circ}{CH_3COONa} + \overset{\circ}{HCl} - \overset{\circ}{NaCl}$  1

$$= (91 + 426 - 126) S \text{ cm}^2 \text{ mol}^{-1} \quad 1$$

$$= \mathbf{391 S \text{ cm}^2 \text{ mol}^{-1}} \quad 1$$

**OR**



$$E_{\text{cell}}^{\circ} = 0.80 \text{ V} - 0.34\text{V} = 0.46\text{V} \quad \text{1/2}$$

Nernst equation

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2} \quad 1$$

$$E_{\text{cell}} = 0.46\text{V} - \frac{0.059}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2} \quad \text{1/2}$$

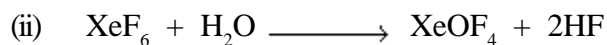
$$0.422\text{V} = 0.46 \text{ V} - \frac{0.059}{2} \log \frac{0.10}{[\text{Ag}^+]^2} \quad 1$$

$$\log \frac{0.10}{[\text{Ag}^+]^2} = 1.2881$$

*(Full marks to be awarded upto this stage)*

$$[\text{Ag}^+]^2 = 0.0051$$

$$[\text{Ag}^+] = 7.1 \times 10^{-2} \text{ M}$$



or



or



- (b) (i) Because of larger size of sulphur atom than oxygen atom.
- (ii) Because bond energy of  $F_2$  is lower than  $Cl_2$  and N-F bond is smaller & stronger than N-Cl bond.
- (iii) Because it has  $sp^3d$  hybridization. 1x3 = 3

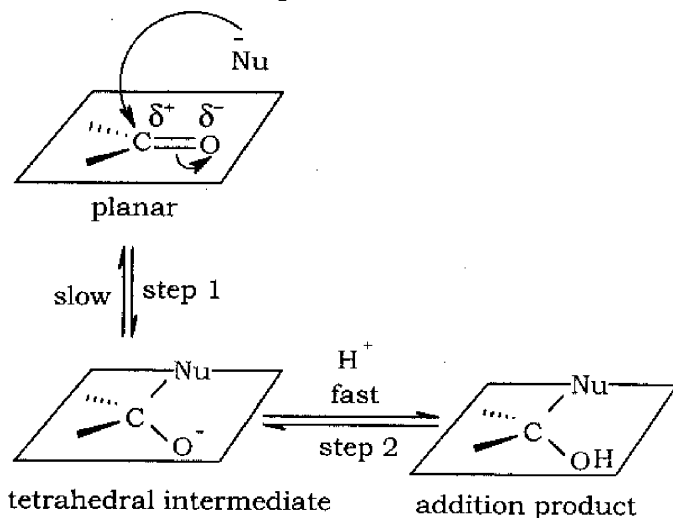
OR

- (a) (i)  $P_4 + 10SO_2Cl_2 \longrightarrow 4PCl_5 + 10SO_2$
- (ii)  $6XeF_4 + 12H_2O \longrightarrow 2XeO_3 + 4Xe + 24HF + 3O_2$  1+1

**(Note: Assign marks for correct products.)**

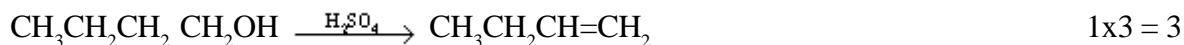
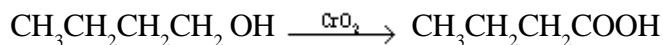
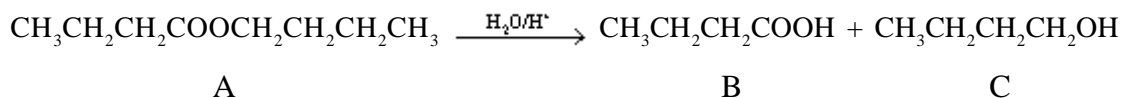
- (b) (i) Because down the group, +3 oxidation state becomes more & more stable due to higher energy involved to unpair the s electrons / due to inert pair effect.
- (ii) Due to the formation of  $[PCl_4]^+ [PCl_6]^-$
- (iii) Because they readily accept an electron. 1x3 = 3

- 30 (a) attack from the top face



2

(b)



OR

(a) **Ethanal and Propanal**

**Iodoform test.** Warm each compound with iodine and sodium hydroxide on a water bath.

Propanal ( $\text{CH}_3\text{CH}_2\text{CHO}$ ) No yellow ppt formed

Ethanal ( $\text{CH}_3\text{CHO}$ ) Yellow crystals of Iodoform are formed. 1

*(Other relevant test can be accepted)*

(ii) **Phenol and Benzoic acid.**

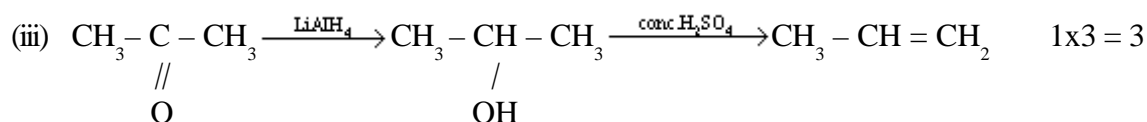
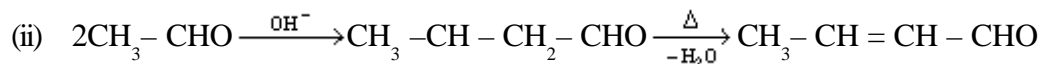
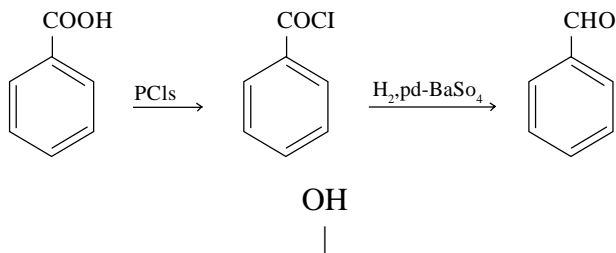
**$\text{FeCl}_3$  test.** Add a few drops of neutral  $\text{FeCl}_3$  solution. 1

Phenol ( $\text{C}_6\text{H}_5\text{OH}$ ), violet coloured ppt. is produced.

Benzoic acid ( $\text{C}_6\text{H}_5\text{COOH}$ ), no ppt. is produced.

*(Other relevant test can be accepted)*

(b) (i)



*(Or by any other suitable method.)*

QUESTION PAPER CODE 56/1

EXPECTED ANSWERS/VALUE POINTS

- |    |  |                             |
|----|--|-----------------------------|
| 1  | Dipole – Dipole interaction  | 1                           |
| 2  | It is molar conductivity at infinite dilution or approaching zero concentration  | 1                           |
| 3  | Because Fluorine is the most electronegative element.  | 1                           |
| 4  | 4-bromo-3-methyl pent-2-ene  | 1                           |
| 5  | $C_6H_5-CH_2-CH(OH)-CH_3$  | 1                           |
| 6  | Ammoniacal solution of silver nitrate is called Tollen's reagent. It is used as an oxidizing reagent / test for –CHO group.  | $\frac{1}{2} + \frac{1}{2}$ |
| 7  | Carbohydrates which reduce Tollen's reagent or Fehling solution are called reducing sugars which have free aldehydic group.  | 1                           |
| 8  | 6,6 means the number of carbon atoms in the monomers of Nylon-6,6  | 1                           |
| 9  | The flow of solvent from solution of low concentration to higher concentration through semipermeable membrane is called osmosis.   | $\frac{1}{2}$               |
|    | The hydrostatic pressure that has to be applied on the solution to prevent the entry of the solvent into the solution through the semipermeable membrane is called the Osmotic Pressure. | $\frac{1}{2}$               |
|    | Advantage: Unlike other colligative properties, osmotic pressure is used to determine the Molar mass of macromolecules/polymers like protein / or any other advantage                    | 1                           |
| 10 | $k = 1/R (l/A)$  | 1                           |
|    | Where k is conductivity, R is resistance and l/A is cell constant  |                             |
|    | $\ddot{E}m = k/C$  | 1                           |
|    | Where $\ddot{E}m$ is molar conductivity and  |                             |
|    | C is concentration of the solution   |                             |

- 11  $\text{Ag}^+ / \text{Ag} < \text{Cu}^{2+} / \text{Cu} < \text{Fe}^{2+} / \text{Fe} < \text{Cr}^{3+} / \text{Cr} < \text{Mg}^{2+} / \text{Mg} < \text{K}^+ / \text{K}$  2

OR

Redox Reaction



$$E^\circ_{\text{cell}} = E^\circ_{\text{C}} - E^\circ_{\text{A}}$$

$$= (+1.51 - 0.15)\text{V} = +1.36\text{V} \quad \frac{1}{2}$$

As  $E^\circ_{\text{cell}}$  is positive, the reaction is **product favoured**  $\frac{1}{2}$

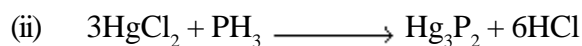
- 12 Tyndall Effect:- The scattering of light by the colloidal particles present in a colloidal sol is called Tyndall effect 1 + 1

Shape Selective Catalysis:- The catalytic reaction that depends upon the pore structure of the catalyst and the size of the reactant and product molecules is called shape-selective catalysis.

- 13 Coagulation is a process of aggregating together the colloidal particles so as to change them into large particles which ultimately settle as a precipitate. 1

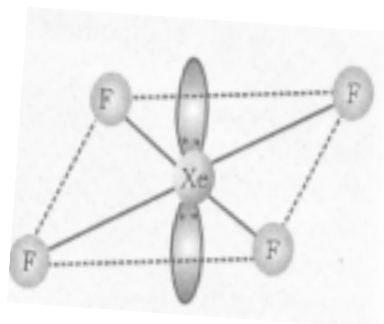
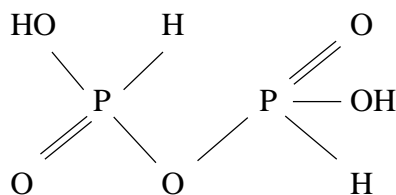
By electrophoresis, coagulation of lyophobic Sols can be carried out / or any other method. 1

- 14 (i)  $\text{I}_2 + 10\text{HNO}_3 \longrightarrow 2\text{HIO}_3 + 10\text{NO}_2 + 4\text{H}_2\text{O}$  1+1



**Note: Assign marks for correct products.**

- 15 (i)



1+1

16 Ethylamine and aniline

Aniline forms an azo-dye with benzenediazoniumchloride through coupling reaction whereas ethylamine does not form an azo-dye. 1

Aniline and benzylamine

Aniline forms an azo-dye with benzenediazoniumchloride through coupling reaction whereas benzylamine does not form an azo-dye. 1

(or any other suitable test)

17 (i) A = CH<sub>3</sub> - CH<sub>2</sub> - CN      B = CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>3</sub>      ½ + ½

(ii) A = C<sub>6</sub>H<sub>5</sub>N<sub>2</sub><sup>+</sup>Cl<sup>-</sup>      B =       ½ + ½

18 (i) CH<sub>2</sub>=CH-Cl      1 + 1

(ii) CF<sub>2</sub>=CF<sub>2</sub>

19  $d = \frac{z \times M}{a^3 \times N_A}$       1

Assuming fcc lattice for copper

$$a = 2\sqrt{2} r$$

$$a^3 = (2\sqrt{2} r)^3 = 8 \times 2\sqrt{2} (1.27 \times 10^{-8} \text{cm})^3$$

$$= 4.723 \times 10^{-23} \text{cm}^3 \quad 1$$

$$d = \frac{4 \times 63.54 \text{ g mol}^{-1}}{4.723 \times 10^{-23} \text{ cm}^3 \times 6.02 \times 10^{23} \text{ mol}^{-1}}$$

$$= \mathbf{8.94 \text{ g cm}^{-3}} \quad 1$$

**Note: If any other lattice is assumed, comparing the density or z-value with the given one, may be accepted as the right procedure.**

20  $\Delta T_f = 7.5^\circ\text{C}$

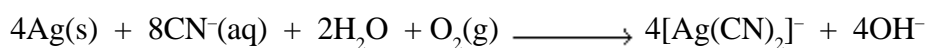
$\Delta T_f = iK_f m$  1

$7.5^\circ\text{C} = 1.87 \times 1.86^\circ\text{C kg mol}^{-1} \times \frac{w}{58.5 \text{g mol}^{-1}} \times \frac{1000}{65 \text{ kg}}$  1

**w = 8.2g** 1

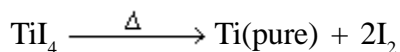
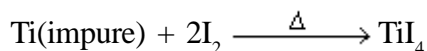
- 21 (i) Role of NaCN in the extraction of silver is to do the leaching of silver ore in the presence of air from which the silver is obtained later by replacement. 1

or



- (ii) Iodine is heated with titanium to form a volatile compound which on further heating decomposes to give pure titanium. 1

or



- (iii) Cryolite lowers the melting point of mixture of alumina in the extraction of aluminium / increase the conductivity of mixture. 1

**OR**

- (i) Froth Floatation method:- The mineral particles become wet by oils while the gangue particles by water.
- (ii) Electrolytic refining: Crude metal is made as anode and pure metal as cathode. When current is passed through electrolyte of same metal ions then pure metal gets deposited at cathode and impurities settle at bottom of anode.
- (iii) Zone Refining:- The impurities are more soluble in the melt than in the solid state of the metal. 1x3 = 3



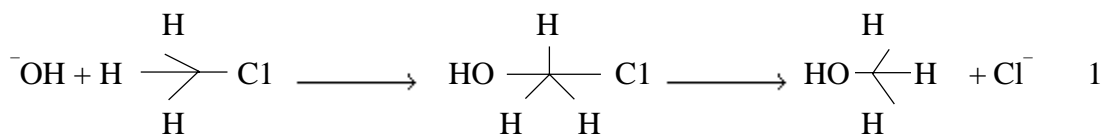
- 22 (i) Because two inner d-orbitals are not available in Ni. 1x3 = 3
- (ii) Because only d-electrons can be involved in  $\delta$ -complex.
- (iii) Because crystal field splitting energy is more than compensated for the third ionisation enthalpy.
- 23 In  $S_N1$  it occurs in two steps and the reaction is of first order whereas in  $S_N2$  it occurs in one step and the reaction is of second order.

or

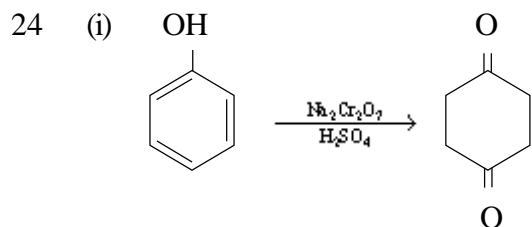
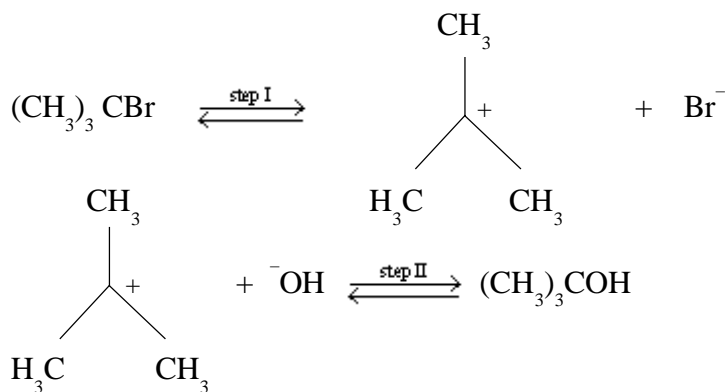
1

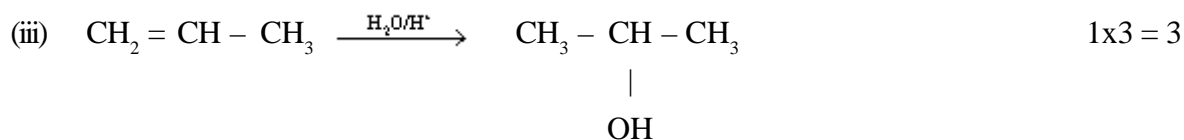
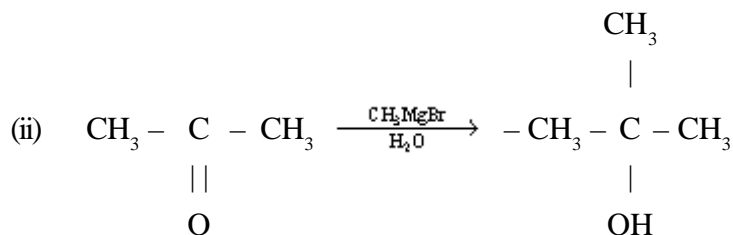
In  $S_N1$  reaction, retention of configuration takes place whereas in  $S_N2$  inversion of configuration occurs.

$S_N2$  example:



$S_N1$  example:





25 (i) Because (a) bond dissociation enthalpy of  $\text{F}_2$  is lower than that of  $\text{Cl}_2$  and (b) small size F atom forms stronger bond with N. 1x3 = 3

(ii) Because it has  $\text{sp}^3\text{d}$  hybridization with 3 lone pairs.

(iii) Because of (a) lower bond dissociation enthalpy of  $\text{F}_2$  and (b) high hydration enthalpy of F

26 Acidic amino acids contain more number of carboxyl groups than amino groups.

Basic amino acids contain more number of amino groups than carboxyl groups.

Neutral amino acids contain equal number of amino acids and carboxyl groups. 1

*(or any other suggestive answer)*

Those amino acids which must be supplied in our diet are called essential amino acids and those which can be made by our bodies and not required in our diet are called non-essential amino acids. 1

Essential amino acids: Valine, leucine, isoleucine, argenine (any one)

Non Essential amino acids: Glycine, alanine (any one) 1

27 (i) Food preservatives: are the compounds which prevent spoilage of food due to microbial growth. eg: sodium benzoate, vinegar (any one example)  $\frac{1}{2} + \frac{1}{2}$

(ii) Enzymes are the biological catalysts which increase the rate of metabolism. eg: Invertase, Zymase, (or any other one example)  $\frac{1}{2} + \frac{1}{2}$

- (iii) Detergents are sodium salts of long chain alkyl sulphonates or benzene sulphonates. eg: Sodium Lauryl sulphate. 1/2+1/2

- 28 (a) (i) Rate of a reaction- Rate of Change of concentration of reactant or product with time is called rate of reaction
- (ii) Activation Energy – Minimum energy which the reacting molecules should acquire so that they react to give product is called activation energy. 1+1

or

The energy required by the reactant molecules for the formation of intermediate activated complex

(b) (i)  $t_{1/2} = \frac{0.693}{k}$  1/2

$$k = \frac{0.693}{37.9} \text{ s}^{-1}$$

$$k = 0.0183 \text{ s}^{-1}$$

$$t = \frac{2.303}{0.183 \text{ s}^{-1}} \log \frac{[A_0]}{[A]} \quad \text{1/2}$$

$$t = \frac{2.303}{0.183 \text{ s}^{-1}} \log \frac{1}{1/4} \quad \text{1}$$

$$t = 75.84 \text{ s}$$

(ii)  $k = \frac{2.303}{60 \text{ s}} \log \frac{[A_0]}{[A]}$

$$\begin{aligned} \log \frac{[A_0]}{[A]} &= \frac{k \times 60}{2.303} \\ &= \frac{0.0183 \times 60}{2.303} \end{aligned}$$

$$\log \frac{[A_0]}{[A]} = 0.4762 \quad 1$$

(Full credit may be given upto this stage)

$$\frac{[A_0]}{[A]} = 2.999$$

$$\text{Therefore, } \frac{[A]}{[A_0]} = 0.33$$

OR

- (a) (i) The sum of powers of the concentration of the reactants in the rate law expression is called the order of that chemical reaction.
- (ii) Molecularity – Number of molecules taking part in rate determining step of a reaction is called molecularity 1+1

$$(b) \log \frac{k_2}{k_1} = \frac{E_a}{2.303 R} \times \frac{T_2 - T_1}{T_1 T_2} \quad 1$$

$$\log 4 = \frac{E_a}{2.303 \times 8.314 \text{ JK}^{-1} \text{ mol}^{-1}} \times \frac{320 - 300}{300 \times 320} \text{ K}^{-1} \quad 1$$

$$0.6020 = \frac{E_a}{2.303 \times 8.314 \text{ JK}^{-1} \text{ mol}^{-1}} \times \frac{20 \text{ K}^{-1}}{96 \times 10^3}$$

$$E_a = 55336.7 \text{ J mol}^{-1}$$

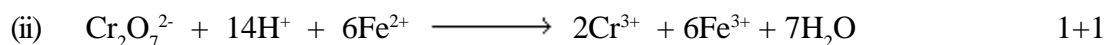
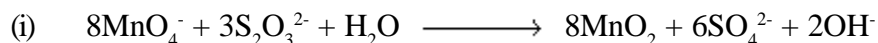
$$= 55.33 \text{ kJ mol}^{-1} \quad 1$$

- 29 (a) (i)  $\text{Cr}_2\text{O}_7^{2-} + 3\text{H}_2\text{S} + 8\text{H}^+ \longrightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O} + 3\text{S}$
- (ii)  $2\text{Cu}^{2+} + 4\text{I}^- \longrightarrow \text{Cu}_2\text{I}_2 + \text{I}_2$  1+1
- (b) (i) It is due to increasing stability of lower species to which they are reduced.

(ii) Because removing 3<sup>rd</sup> e<sup>-</sup> from extra stable 3d<sup>5</sup> configuration is difficult in case of Mn

(iii) Because d<sup>3</sup> of Cr<sup>2+</sup> is more stable than d<sup>5</sup> of Fe<sup>3+</sup> 1x3 = 3

OR



(b) (i) In La<sup>3+</sup>, there is no f electrons while in Lu<sup>3+</sup>, there is presence of f<sup>14</sup> / absence of unpaired electron / due to d-d transition.

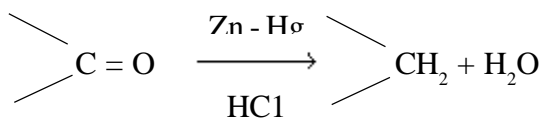
(ii) Mn<sup>2+</sup> has 3d<sup>5</sup> configuration having 5 unpaired electrons

(i) Cu<sup>+</sup> undergoes disproportionation in aqueous solution. 1x3 = 3

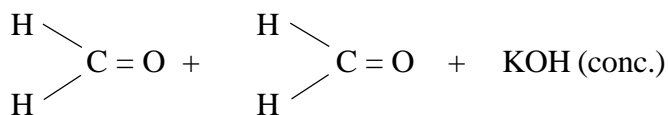
or



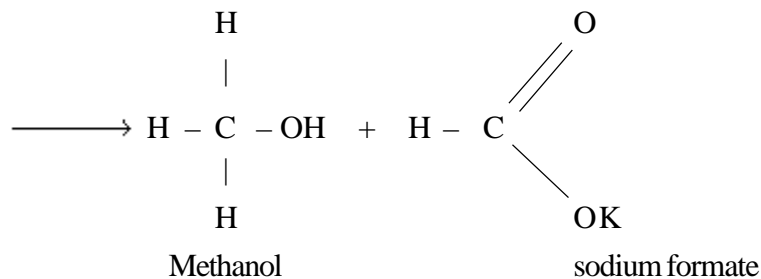
30 (a) (i) Clemmensen reduction

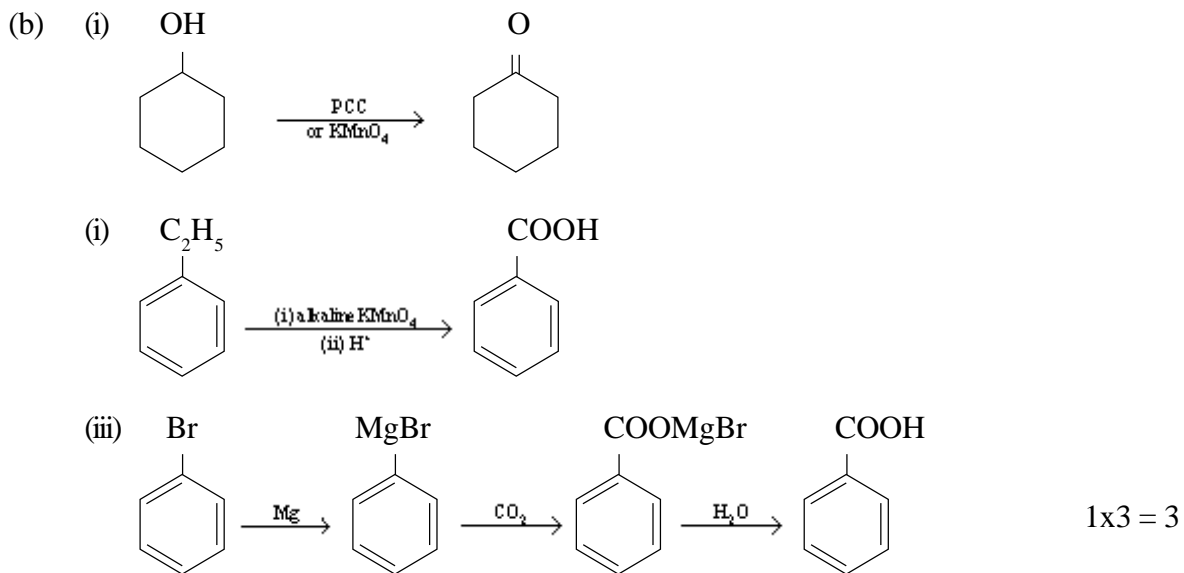


(a) (ii) **Cannizzaro reaction:**



formaldehyde

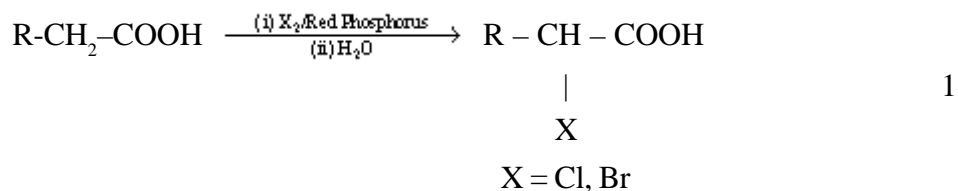




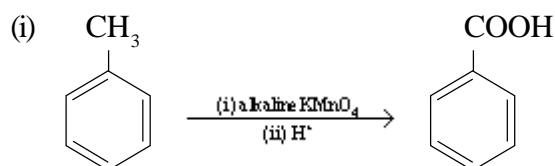
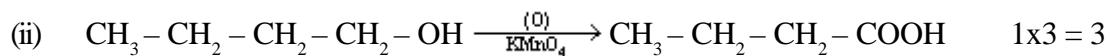
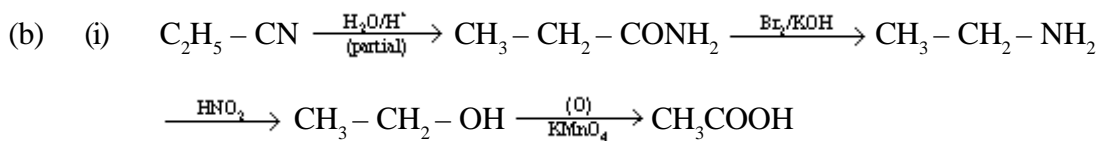
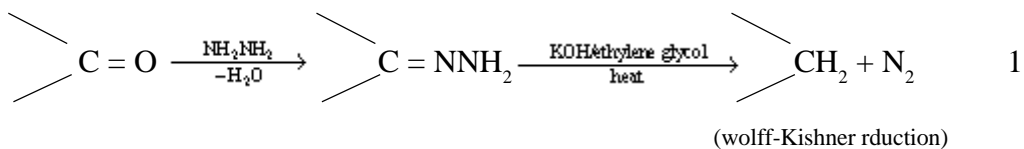
(or by any other suitable method)

OR

(a) (i) **Hell-Volhard-Zelinsky reaction**



(ii) **Wolf-kishner reduction**



# BIOLOGY (Theory)

*Time allowed : 3 hours*

*Maximum Marks : 70*

## **General Instructions:**

- (i) *All questions are compulsory.*
- (ii) *The question paper consists of four sections A, B, C and D. Section A contains 8 questions of one mark each, Section B is of 10 questions of two marks each, Section C is of 9 questions of three marks each and Section D is of 3 questions of five marks each.*
- (iii) *There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.*
- (iv) *Wherever necessary, the diagrams drawn should be neat and properly labelled.*

## **QUESTION PAPER CODE 57/1/1**

### **SECTION A**

1. A bilobed, dithecous anther has 100 microspore mother cells per microsporangium. How many male gametophytes this anther can produce? [1 mark]
2. Mention two functions of the codon AUG. [1 mark]
3. Name the scientist who disproved spontaneous generation theory. [1 mark]
4. What is it that prevents a child to suffer from a disease he/she is vaccinated against? Give one reason. [1 mark]
5. Why is the enzyme cellulase used for isolating genetic material from plant cells but not for animal cells? [1 mark]
6. Name a molecular diagnostic technique to detect the presence of a pathogen in its early stage of infection. [1 mark]
7. If 8 individuals in a laboratory population of 80 fruitflies died in a week, then what would be the death rate for population for the said period? [1 mark]

8. Mention one positive and one negative application of amniocentesis. [1 mark]

**SECTION - B**

9. A moss plant produces a large number of antherozoids but relatively only a few egg cells. Why? 2
10. Mention the reasons for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm. 2
11. How does an electrostatic precipitator work to remove particulate pollutants released from the thermal power plants? 2
12. Name the type of food chains responsible for the flow of larger fraction of energy in an aquatic and a terrestrial ecosystem respectively. Mention one difference between the two food chains. 2
13. How does a test-cross help in identifying the genotype of the organism? Explain. 2
14. Name the host and the site where the following occur in the life-cycle of a malarial parasite :
- (a) Formation of gametocytes
- (b) Fusion of gametocytes 2
15. Honey collection improves when beehives are kept in crop-fields during flowering season. Explain. 2

**OR**

How does addition of a small amount of curd to fresh milk help formation of curd? Mention a nutritional quality that gets added to the curd.

16. Why is the introduction of genetically engineered lymphocytes into a ADA deficiency patient not a permanent cure? Suggest a possible permanent cure. 2
17. How does the floral pattern of Mediterranean orchid *Ophrys* guarantee cross pollination? 2



18. In the biosphere immense biological diversity exists at all levels of biological organisation. Explain any two levels of biodiversity. 2

SECTION - C

19. Draw a longitudinal section of a post - pollinated pistil showing entry of pollen tube into a mature embryo-sac. Label filiform apparatus, chalazal end, Hilum, antipodals, male gametes and secondary nucleus. 3

OR

Draw a labelled sectional view of seminiferous tubule of a human male.

20. During his studies on genes in *Drosophila* that were sex-linked T.H. Morgan found F<sub>2</sub> - population phenotypic ratios deviated from expected 9 : 3 : 3 : 1. Explain the conclusion he arrived at. 3
21. Describe the initiation process of transcription in bacteria. 3
22. Explain convergent and divergent evolution with the help of one example of each. 3
23. Name the type of human cell HIV attacks on its entry into the body. Explain the events that occur in the cell which further lead to cause immunodeficiency syndrome. 3
24. Explain the efforts which must be put in to improve health, hygiene and milk yield of cattle in a dairy farm. 3
25. Identify a, b, c, d, e and f in the table given below: 3

	Organism	Bioactive molecule	Use
1.	<i>Monascus perpureus</i> (yeast)	a	b
2.	c	d	antibiotic
3.	e	Cyclosporin A	f

26. Eco RI is used to cut a segment of foreign DNA and that of a vector DNA to form a recombinant DNA. Show with the help of schematic diagrams. 3

- (i) The set of palindromic nucleotide sequence of base pairs the Eco RI will recognise in both the DNA segments. Mark the site at which Eco RI will act and cut both the segments.
  - (ii) Sticky ends formed on both the segments where the two DNA segments will join later to form a recombinant DNA.
27. How does RNA interference help in developing resistance in tobacco plant against nematode infection? 3

**SECTION - D**

28. (a) How does a chromosomal disorder differ from a Mendelian disorder?
- (b) Name any two chromosomal aberration associated disorders.
- (c) List the characteristics of the disorders mentioned above that help in their diagnosis. 5

**OR**

Fitness is the end result of the ability to adapt and get selected by Nature. Explain with suitable example.

29. When and where are primary oocytes formed in a human female? Trace the development of these oocytes till ovulation (in menstrual cycle). How do gonadotropins influence this developmental process? 5

**OR**

- (a) Explain the events taking place at the time of fertilization of an ovum in a human female.
- (b) Trace the development of the zygote upto its implantation in the uterus.
- (c) Name and draw a labelled sectional view of the embryonic stage that gets implanted.

30. Draw and explain a logistic curve for a population of density (N) at time (t) whose intrinsic rate of natural increase is (r) and carrying capacity is (k). 5

**OR**

Describe the process of decomposition of detritus under the following heads:  
Fragmentation; leaching; catabolism; humification and mineralization.

**QUESTION PAPER CODE 57/1**

**SECTION A**

1. Mention the site where syngamy occurs in amphibians and reptiles respectively. 1
2. How is snow-blindness caused in humans? 1
3. Name one autosomal dominant and one autosomal recessive Mendelian disorder in humans. 1
4. How is the action of exonuclease different from that of endonuclease? 1
5. India has more than 50,000 strains of rice. Mention the level of biodiversity it represents. 1
6. Mention the information that the health workers derive by measuring BOD of a water body. 1
7. Name the enzyme involved in the continuous replication of DNA strand. Mention the polarity of the template strand. 1
8. Offsprings derived by asexual reproduction are called clones. Justify giving two reasons. 1

**SECTION B**

9. Mention the role of ribosomes in peptide-bond formation. How does ATP facilitate it? 2
10. How do copper and hormone releasing IUDs act as contraceptives? Explain. 2

11. If you squeeze a seed of orange you might observe many embryos of different sizes. How is it possible? Explain. 2
12. A recombinant DNA is formed when sticky ends of vector DNA and foreign DNA join. Explain how the sticky ends are formed and get joined. 2
13. (i) Mention the number of primers required in each cycle of polymerase chain reaction (PCR). Write the role of primers and DNA polymerase in PCR. 2
- (ii) Give the characteristic feature and source organism of the DNA polymerase used in PCR. 2
14. Define the term 'health'. Mention any two ways of maintaining it. 2

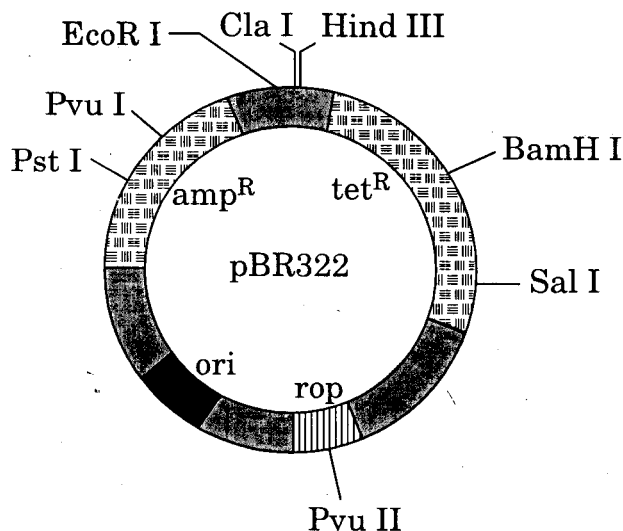
**OR**

- Why does a doctor administer tetanus antitoxin and not a tetanus vaccine to a child injured in a roadside accident with a bleeding wound? Explain. 2
15. Giving two reasons explain why there is more species biodiversity in tropical latitudes than in temperate ones. 2
16. Name an opioid drug and its source plant. How does the drug affect the human body? 2
17. Mention the major cause of air pollution in metro cities. Write any three ways by which it can be reduced. 2
18. How did Eli Lilly synthesise the human insulin? Mention one difference between this insulin and the one produced by the human pancreas. 2

**SECTION C**

19. (i) Write the characteristic features of anther, pollen and stigma of wind pollinated flowers. 3
- (ii) How do flowers reward their insect pollinators? Explain.
20. (i) Why are grasshopper and *Drosophila* said to show male heterogamity? Explain.

- (ii) Explain female heterogamity with the help of an example. 3
21. In a series of experiments with *Streptococcus* and mice F. Griffith concluded that R-strain bacteria had been transformed. Explain. 3
22. (a) How does the Hardy - Weinberg's expression ( $p^2 + 2pq + q^2 = 1$ ) explain that genetic equilibrium is maintained in a population?
- (b) List any two factors that can disturb the genetic equilibrium. 3
23. Mention the name of the causal organism, symptoms and the mode of transmission of the disease Amoebiasis. 3
24. (i) Mention the property that enables the explants to regenerate into a new plant.
- (ii) A banana herb is virus-infected. Describe the method that will help In obtaining healthy banana plants from this diseased plant. 3
25. Mention the product and its use produced by each of the microbes listed below: 3
- (i) *Streptococcus*
- (ii) *Lactobacillus*
- (iii) *Saccharomyces cerevisiae*
26. (i) Name the organism in which the vector shown is inserted. to get the copies of the desired gene.
- (ii) Mention the area labelled in the vector responsible for controlling the copy number of the inserted gene.
- (iii) Name and explain the role of a selectable marker in the vector shown. 3



**OR**

Name the insect pest that is killed by the products of *cry* IAc gene. Explain how the gene makes the plant resistant to the insect pest.

3

27. How do organisms like fungi, zooplanktons and bears overcome the temporary short-lived climatic stressful conditions? Explain.

3

#### **SECTION D**

28. Describe in sequence the events that lead to the development of a 3-celled pollen grain from microspore mother cell in angiosperms.

5

**OR**

(a) Give a schematic representation showing the events of spermatogenesis in human male.

(b) Describe the structure of a human sperm.

3+2

29. (a) State the law of independent assortment.

(b) Using Punnett Square demonstrate the law of independent assortment in a dihybrid cross involving two heterozygous parents.

1+4

**OR**

How did Alfred Hershey and Martha Chase arrive at the conclusion that DNA is the genetic material? 5

30. (a) Why are herbivores considered similar to predators in the ecological context? Explain.

(b) Differentiate between the following interspecific interactions in a population:

(i) Mutualism and Competition

(ii) Commensalism and Amensalism 5

**OR**

(a) Trace the succession of plants on a dry bare rock.

(b) How does phosphorus cycle differ from carbon cycle? 4+1

## Marking Scheme ó Biology (Theory)

### General Instructions :

#### *The Marking Scheme and mechanics of marking*

1. In the marking scheme the marking points are separated by commas, one oblique line (/) indicates acceptable alternative, two obliques (//) indicate complete acceptable alternative set of marking points.
2. Any words/phrases given within brackets do not have marks.
3. Allow spelling mistakes unless the misspelt word has another biological meaning. Ignore plurals unless otherwise stated in the marking scheme.
4. In any question exclusively on diagram no marks on any description. But in questions on descriptions, same value points may be marked on the diagrams as a substitute.
5. All awarded marks are to be written in the left hand margin at the end of the question or its part.
6. Place a tick (✓) in red directly on the key/operative term or idea provided if it is in correct context. Place “Half-tick” ½ wherever there is ½ mark in the marking scheme. (Do not place tick indiscriminately just to show that you have read the answer).
7. If no marks are awarded to any part or question put a cross (×) at incorrect value portion and mark it zero (in words only).
8. Add up ticks or the half ticks for a part of the question, do the calculation if any, and write the part total or the question total in the left hand margin.
9. Add part totals of the question and write the question total at the end. Count all the ticks for the entire question as a recheck and draw a circle around the question total to confirm correct addition.
10. If parts have been attempted at different places do the totalling at the end of the part attempted last.
11. If any extra part is attempted or any question is reattempted, score out the last one and write “extra”.
12. In questions where only a certain number of items are asked evaluate only that many numbers in sequence as is asked ignoring all the extra ones even if otherwise correct.
13. Transcribe the marks on the cover page. Add up question totals. Recheck the script total by adding up circled marks in the script.
14. Points/answer given in brackets in marking scheme are not so important and may be ignored for marking.



QUESTION PAPER CODE 57/1/1  
EXPECTED ANSWERS/VALUE POINTS

**SECTION A**

**Q.Nos. 1 - 8 are of one mark each.**

- 1. A bilobed, dithecos anther has 100 microspore mother cells per microsporangium. How many male gametophytes this anther can produce ?**

Ans. 1600

[1 mark]

- 2. Mention two functions of the codon AUG.**

Ans. Initiator Codon, codes for Methionine =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

- 3. Name the scientist who disproved spontaneous generation theory.**

Ans. Louis Pasteur (If only Pasteur =  $\frac{1}{2}$ )

[1 mark]

- 4. What is it that prevents a child to suffer from a disease he/she is vaccinated against ? Give one reason.**

Ans. Antibodies produced , kills pathogen / destroys antigen  
// provides immunity against pathogen =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

- 5. Why is the enzyme cellulase used for isolating genetic material from plant cells but not for animal cells ?**

Ans. Animal cells do not have cellulose cell walls; (hence do not need the enzyme) , plant cell have cellulose in their cell wall; (hence need enzyme to break it down) =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

- 6. Name a molecular diagnostic technique to detect the presence of a pathogen in its early stage of infection.**

Ans. Recombinant DNA technology / Polymerase Chain Reaction (PCR) / ELISA *Any one* = 1

[1 mark]

- 7. If 8 individuals in a laboratory population of 80 fruitflies died in a week, then what would be the death rate for population for the said period ?**

Ans. 0.1 , individuals per fruitfly per week =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

- 8. Mention one positive and one negative application of amniocentesis .**

Ans. To detect genetic disorder, may lead to (illegal) female foeticide =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

**SECTION B**

***Q. Nos. 9 - 18 are of two marks each***

**9. A moss plant produces a large number of antherozoids but relatively only a few egg cells. Why?**

Ans. Eggs are stationary / non-motile within the plant body / antherozoids carried by water , lost in transit =  $\frac{1}{2} \times 4$

[ 2 marks]

**10. Mention the reasons for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm.**

Ans. Zygote formed by the fusion of male gamete (n) and egg cell (n) , hence diploid (2n) =  $\frac{1}{2} + \frac{1}{2}$

Primary endosperm nucleus formed by the fusion of two polar nuclei / secondary nucleus (n + n) and male gamete (n) , hence triploid (3n) =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 = 2 marks]

**11. How does an electrostatic precipitator work to remove particulate pollutants released from the thermal power plants ?**

Ans. Electrode wires at several thousand volts produce a corona that releases electrons , electrons attach to dust particles , (dust particles) become negatively charged , are attracted to collecting plates , low velocity of air help settling of dust =  $\frac{1}{2} \times 4$

[2 marks]

**12. Name the type of food chains responsible for the flow of larger fraction of energy in an aquatic and a terrestrial ecosystem respectively. Mention one difference between the two food chains.**

Ans. Aquatic ecosystem - Grazing Food Chain / GFC =  $\frac{1}{2}$

Terrestrial ecosystem - Detritus Food Chain / DFC =  $\frac{1}{2}$

Difference : GFC begins with phytoplanktons / producers whereas DFC begins with dead organisms / detritus = 1

[1 + 1 = 2 marks]

**13. How does a test-cross help in identifying the genotype of the organism ? Explain.**

Ans. Cross between an organism with unknown genotype (expressing dominant trait) , and an organism with recessive trait (homozygous) =  $\frac{1}{2} + \frac{1}{2}$

If all offsprings show dominant trait the organism is homozygous (dominant) , if half organisms show dominant and half recessive then the organism is heterozygous (dominant) =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 = 2 marks]

**14. Name the host and the site where the following occur in the life-cycle of a malarial parasite:**

(a) **Formation of gametocytes**

(b) **Fusion of gametocytes**

Ans. (a) Human , RBC =  $\frac{1}{2} + \frac{1}{2}$

(b) Female *Anopheles* (mosquito) , intestine =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 = 2 marks]

**15. Honey collection improves when beehives are kept in crop-fields during flowering season. Explain.**

Ans. Bees visit flowers for collecting nectar / pollen (for honey) , more the number of flowers (during flowering season) larger is the nectar / pollen collection (hence more honey production) = 1 + 1

[2 marks]

**OR**

**How does addition of a small amount of curd to fresh milk help in formation of curd? Mention a nutritional quality that gets added to the curd.**

Inoculum or starter contains (millions) of LAB which multiply at a suitable temperature , produce acids / lactic acid that coagulates , and partially digests the milk proteins thus converting milk to curd, it also improves its nutritional quality (of milk) by increasing vitamin B<sub>12</sub> =  $\frac{1}{2} \times 4$

[2 marks]

**16. Why is the introduction of genetically engineered lymphocytes into an ADA deficiency patient not a permanent cure ? Suggest a possible permanent cure.**

Ans. Lymphocytes not immortal / short lived , hence patient requires periodic infusion of such genetically engineered lymphocytes , however if a gene producing ADA is isolated from marrow cells , and introduced into the cells at early embryonic stages it could be a permanent cure =  $\frac{1}{2} \times 4$

[2 marks]

**17. How does the floral pattern of Mediterranean orchid *Ophrys* guarantee cross pollination?**

Ans. One petal of *Ophrys* resembles the female of a bee, male bees are attracted to it / perceives it as female , pseudocopulates , same male bee pseudocopulates with another flower of *Ophrys* and pollination is completed =  $\frac{1}{2} \times 4$

[2 marks]

**18. In the biosphere immense biological diversity exists at all levels of biological organisation. Explain any two levels of biodiversity.**

Ans. (i) **Genetic diversity:** A single species might show high diversity at the genetic level over its distributional range. The genetic variation shown by the medicinal plant *Rauwolfia vomitoria*

growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces. India has more than 50000 genetically different strains of rice and 1000 varieties of mango / any other example explained

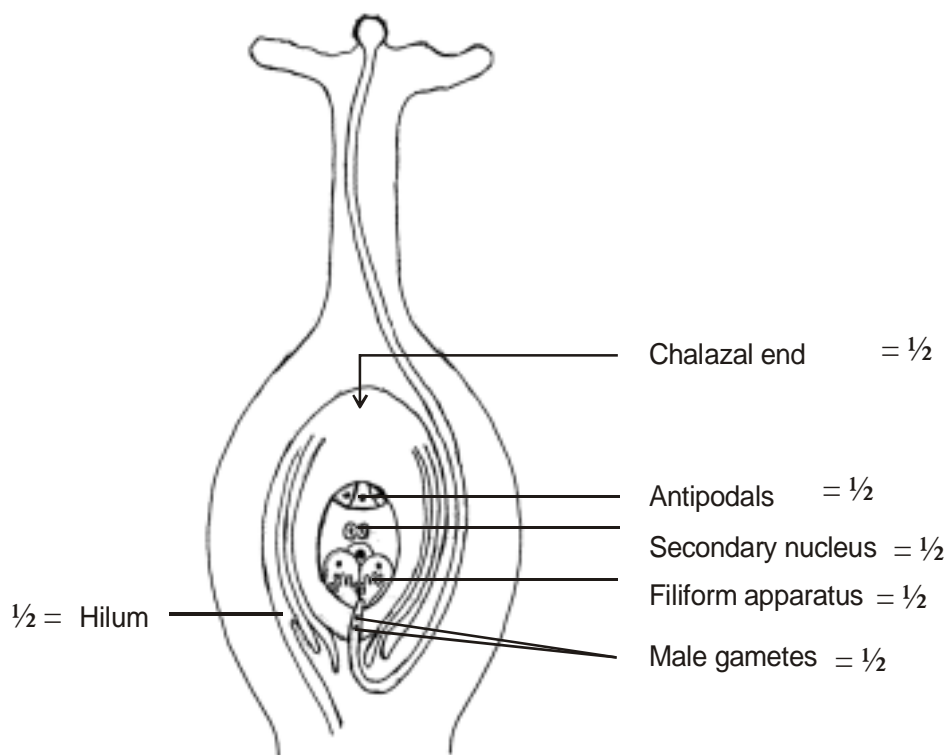
- (ii) **Species diversity:** The diversity at the species level. For example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats.
- (iii) **Ecological diversity:** At the ecosystem level, India, for instance, with its deserts / rain forests / mangroves / coral reefs / wetlands / estuaries / and alpine meadows has a greater ecosystem diversity than a Scandinavian country like Norway (**Any two**) = 1 + 1

[2 marks]

### SECTION C

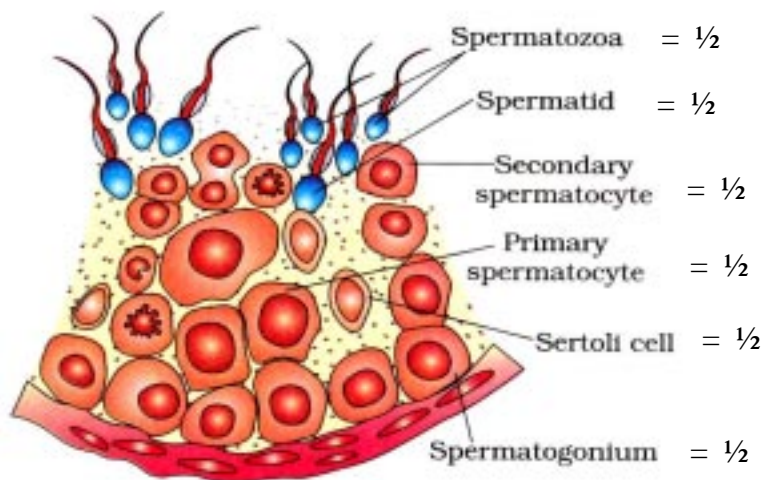
*Q. Nos. 19 - 27 are of three marks each*

19. Draw a longitudinal section of a post - pollinated pistil showing entry of pollen tube into a mature embryo-sac. Label filiform apparatus, chalazal end, hilum, antipodals, male gametes and secondary nucleus.



OR

Draw a labelled sectional view of seminiferous tubule of a human male.



[ $\frac{1}{2} \times 6 = 3$  marks]

20. During his studies on genes in *Drosophila* that were sex-linked T.H. Morgan found  $F_2$  - population phenotypic ratios deviated from expected 9:3:3: 1. Explain the conclusion he arrived at.

- Ans. (i) Linkage , genes on the same chromosome were either closely associated or far apart
- (ii) Higher percentage of parental combination and fewer percentage of recombinants are observed when two genes are located very close / tightly linked on the same chromosome
- (iii) Higher percentage of recombinants and fewer percentage of parental combinations are observed when two genes are located far apart / loosely linked on the same chromosome =  $1 \times 3$

[3 marks]

21. Describe the initiation process of transcription in bacteria.

- Ans. (DNA dependent) RNA polymerase , binds to the promoter , at 5' end, associates transiently with initiation factor / sigma factor , using nucleoside triphosphates as substrate , and energy initiates transcription =  $\frac{1}{2} \times 6$

[3 marks]

22. Explain convergent and divergent evolution with the help of one example of each.

- Ans. **Convergent** - different structures evolving in the same direction in different organisms = 1  
eg. wings of butterfly and of birds / eye of octopus and of mammals / the flippers of penguins and dolphins / sweet potato and potato. **Any one** =

**Divergent** - Same structure evolving in different directions in different organisms = 1

eg. forelimbs of whales , bats , cheetah and humans/vertebrate hearts or brains/thorns of *Bougainvillea* and tendrils of cucurbita. **Any one** =

[1½ + 1½ = 3 marks]

**23. Name the type of human cell HIV attacks on its entry into the body. Explain the events that occur in the cell which further lead to cause immunodeficiency syndrome.**

Ans. Macrophages = ½

Virus enters a macrophage where RNA genome of the virus with the help of reverse transcriptase , replicates to form a viral DNA , viral DNA incorporates into host cell's DNA , directs infected cells to produce virus particles , These virus particle enters the helper T-lymphocytes repeatedly to produce progeny viruses thus decreasing their number drastically = ½ × 5 = 2½

[½ + 2½ = 3 marks]

**24. Explain the efforts which must be put in to improve health, hygiene and milk yield of cattle in a dairy farm.**

Ans. Should be taken to veterinary doctor , housed well , have adequate water , be maintained disease free , feeding should be carried out keeping quality , and quantity of fodder in mind , maintain stringent cleanliness and hygiene **Any six** = 6

[3 marks]

**25. Identify a, b, c, d, e and f in the table given below :**

	Organism	Bioactive molecule	Use
1.	<i>Monascus purpureus</i> (yeast)	_____ a _____	_____ b _____
2.	_____ c _____	_____ d _____	antibiotic
3.	_____ e _____	Cyclosporin A	_____ f _____

Ans. a - Statins = ½

b - Blood cholesterol lowering agent = ½

c - *Penicillium notatum* = ½

d - Penicillin = ½

e - *Trichoderma polysporum* = ½

f - Immuno-suppressive agent in organ transplant patients = ½

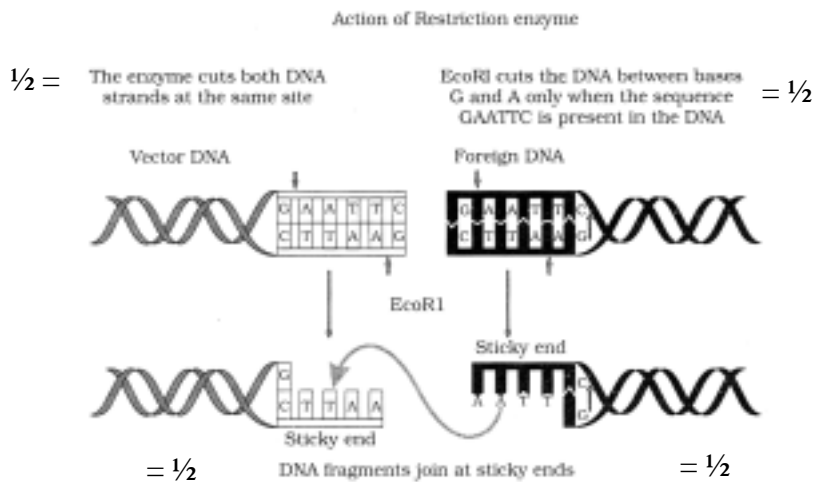
[½ × 6 = 3 Marks]

**26. Eco RI is used to cut a segment of foreign DNA and that of a vector DNA to form a recombinant DNA. Show with the help of schematic diagrams.**

(i) **The set of palindromic nucleotide sequence of base pairs the Eco RI will recognise in both the DNA segments. Mark the site at which Eco RI will act and cut both the segments.**

- (ii) **Sticky ends formed on both the segments where the two DNA segments will join later to form a recombinant DNA.**

Ans. Palindromic sequence GAATTC =  $\frac{1}{2}$



[ $\frac{1}{2} \times 6 = 3$  marks]

27. **How does RNA interference help in developing resistance in tobacco plant against nematode infection ?**

Ans With RNA interference (RNAi) technique transgenic tobacco plant is protected against nematode / *Meloidogyne incognitia* using *Agrobacterium* as the vectors , nematode-specific genes were introduced into the host plant , it produces both sense & anti sense RNA , these 2 RNAs form ds RNA, it silences specific mRNA of nematode (no protein synthesis / no translation ) , hence nematode cannot survive in tobacco plant =  $\frac{1}{2} \times 6$

[3 Marks]

#### SECTION-D

*Q. Nos. 28 - 30 are of five marks each*

28. (a) **How does a chromosomal disorder differ from a Mendelian disorder ?**  
 (b) **Name any two chromosomal aberration associated disorders.**  
 (c) **List the characteristics of the disorders mentioned above that help in their diagnosis.**

Ans. (a) Mendelian disorders are mainly determined by alteration or mutation in the single gene , chromosomal disorders are due to absence / excess / abnormal arrangement of one or more chromosomes =  $\frac{1}{2} + \frac{1}{2}$

(b) Turner's syndrome , Klinefelter's syndrome , Down's syndrome ( *Name Any two* ) =  $1 + 1$

- (c) **Turner's syndrome** : (XO) Such females are sterile as ovaries are rudimentary besides other features including lack of secondary sexual characters.

**Klinefelter's syndrome** : (XXY) Such an individual though has over all masculine development but feminine development ( development of breast i.e Gynaecomastia) is also expressed. Such individual are sterile.

**Down's syndrome** : (Trisomy of 21) The affected individual is short statured with small round head , furrowed tongue and partially opened mouth. Palm is broad with characterisitic palm crease. Physical -psychomotor and mental development is retarded.

Characteristics of **Any two** disorders named and evaluated above = 1 + 1

[1 + 2 + 2 = 5 marks]

**OR**

**Fitness is the end result of the ability to adapt and get selected by Nature. Explain with suitable example.**

- Ans. **Industrial Melanism** : Before industrialisation started in England it was observed , there were more white-winged peppered moth , on trees than dark winged moth , but after industrialisation , there were more dark-winged moths in the same area , predators spot a moth against a contrasting background , post industrialisation the tree trunks became dark due to industrial smoke and soot , Under this condition the white-winged moth did not survive , due to predators , but the dark-winged moth managed to survive.

// or any other example explained under the following heads in the text book - fitness , selection and adaptation.

[5 marks]

- 29. When and where are primary oocytes formed in a human female ? Trace the development of these oocytes till ovulation (in menstrual cycle). How do gonadotropins influence this developmental process ?**

- Ans. During embryonic development , in foetal ovary =  $\frac{1}{2} + \frac{1}{2}$

Each primary oocyte gets surrounded by a layer of granulosa cells and is called a primary follicle , large number of these primary follicles degenerate from birth to puberty , primary follicles gets surrounded by more granulosa cells and a new theca and is now called secondary follicle which transform to tertiary follicle that has a fluid filled cavity called antrum , it completes its first meiotic division which results in the formation of a large haploid secondary oocyte and a tiny first polar body , tertiary follicle changes into mature Graafian follicle (secondary oocyte forms new membrane called zona pellucida) , which ruptures to release ovum (this is called ovulation) =  $\frac{1}{2} \times 6$

Gonadotropins (LH and FSH) help in follicular development , LH surge induces ovulation. =  $\frac{1}{2} + \frac{1}{2}$

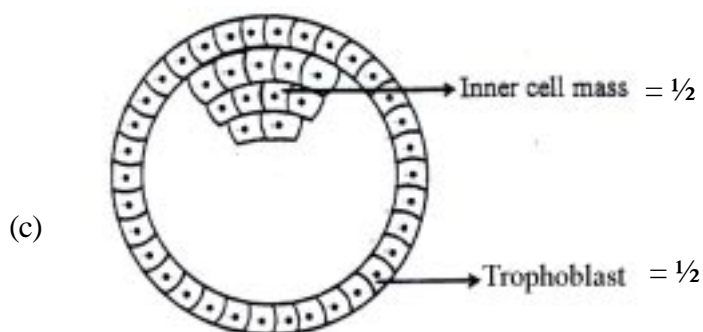
[1 + 3 + 1 = 5 marks]



OR

- (a) Explain the events taking place at the time of fertilization of an ovum in a human female.
- (b) Trace the development of the zygote upto its implantation in the uterus.
- (c) Name and draw a labelled sectional view of the embryonic stage that gets implanted.

- Ans. (a) During fertilization a sperm comes in contact with the zona pellucida layer of the ovum and induces changes in the membrane, this blocks the entry of additional sperms and only one sperm can fertilise and ovum, the secretions of acrosome help the sperm enter into the cytoplasm of the ovum through zona pellucida and the plasma membrane, soon the haploid nucleus of the sperm and the ovum fuse together to form a diploid zygote =  $\frac{1}{2} \times 4$
- (b) Zygote moves through the isthmus of the oviduct and undergoes cleavage and it moves towards the uterus to form blastomeres, the embryo with 8 - 16 blastomeres is called morula which continues to divide and transforms into a blastocyst as it moves further into the uterus, It is arranged into an outer layer called trophoblast and an inner cell mass, the trophoblast get attached to the endometrium and inner cell mass gets differentiated into the embryo the uterine cell divides rapidly and covers the blastocysts which get embedded into the uterus. (This is called implantation) =  $\frac{1}{2} \times 4$

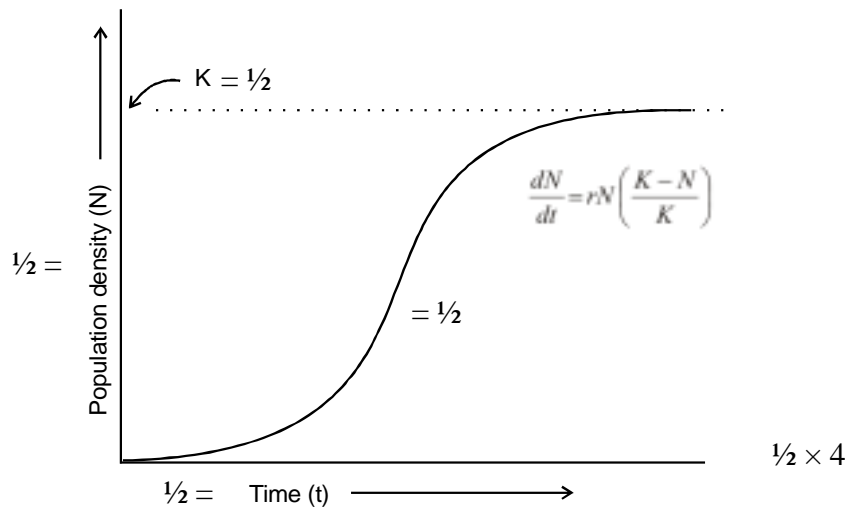


[2 + 2 + 1 = 5 marks]

30. Draw and explain a logistic curve for a population of density (N) at time (t) whose intrinsic rate of natural increase is (r) and carrying capacity is (k).

- Ans. A population growing in a habitat with limited resources show initially a lag phase, this is followed by phases of acceleration and deceleration, and finally an asymptote when the population density reaches carrying capacity (K), A plot of N in relation to time (t) result in a sigmoid curve (Verhulst - Pearl Logistic Growth) =  $\frac{1}{2} \times 4$

$$\frac{dN}{dt} = rN \left( \frac{K - N}{K} \right) = 1$$



[2 + 1 + 2 = 5 marks]

**OR**

**Describe the process of decomposition of detritus under the following heads : Fragmentation; leaching; catabolism; humification and mineralization.**

Ans. **Fragmentation** : Breakdown of detritus into smaller particles

**Leaching** : Water soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts

**Catabolism** : Bacterial and fungal enzymes degrade detritus into simpler inorganic substances

**Humification** : It leads to the accumulation of a dark coloured amorphous substance called humus that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate

**Mineralization** : The humus is further degraded by some microbes and release inorganic substances by this process

[1 × 5 = 5 marks]

QUESTION PAPER CODE 57/1  
EXPECTED ANSWERS/VALUE POINTS

**SECTION A**

**Q.Nos. 1 - 8 are of one mark each.**

**1. Mention the site where syngamy occurs in amphibians and reptiles respectively.**

Ans Amphibians – outside the body / in external medium =  $\frac{1}{2}$   
Reptiles – inside the body =  $\frac{1}{2}$

[ $\frac{1}{2} + \frac{1}{2} = 1$  Mark]

**2. How is snow-blindness caused in humans ?**

Ans High dose of UV-B radiation, inflammation of cornea =  $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

**3. Name one autosomal dominant and one autosomal recessive Mendelian disorder in humans.**

Ans Autosomal dominant – Myotonic dystrophy =  $\frac{1}{2}$   
Autosomal recessive – Phenylketonuria / sickle cell anaemia / cystic fibrosis / Thalesemia =  $\frac{1}{2}$

[1 Mark]

**4. How is the action of exonuclease different from that of endonuclease ?**

Ans Exonuclease : removes nucleotides from the ends of DNA molecules =  $\frac{1}{2}$   
Endonuclease : makes cut at specific position within a DNA =  $\frac{1}{2}$

[1 Mark]

**5. India has more than 50,000 strains of rice. Mention the level of biodiversity it represents.**

Ans Genetic Biodiversity

[1 Mark]

**6. Mention the information that the health workers derive by measuring BOD of a water body.**

Ans A measure of organic waste matter present in the water, greater the BOD more is its polluting potential =  $\frac{1}{2} + \frac{1}{2}$

[ $\frac{1}{2} + \frac{1}{2} = 1$  Mark]

**7. Name the enzyme involved in the continuous replication of DNA strand. Mention the polarity of the template strand.**

Ans (DNA dependent) DNA polymerase 3' → 5' =  $\frac{1}{2} + \frac{1}{2}$

[ $\frac{1}{2} + \frac{1}{2} = 1$  Mark]

**8. Offsprings derived by asexual reproduction are called clones. Justify giving two reasons.**

Ans Morphologically (structurally) similar, genetically identical =  $\frac{1}{2} + \frac{1}{2}$

[ $\frac{1}{2} + \frac{1}{2} = 1$  Mark]

## SECTION B

Q.Nos. 9 - 18 are of 2 marks each.

**9. Mention the role of ribosomes in peptide-bond formation. How does ATP facilitate it ?**

Ans Provides the sites for the binding of amino acid, acts as a catalyst (23S r RNA) for the formation of peptide bond =  $\frac{1}{2} + \frac{1}{2}$

ATP provides the energy for the bond formation = 1

[1 + 1 = 2 Marks]

**10. How do copper and hormone releasing IUDs act as contraceptives ? Explain.**

Ans Copper releasing IUDs- Increase phagocytosis of sperms, suppress sperm mobility, suppress the fertilising capacity of sperm (**Any two**) =  $\frac{1}{2} + \frac{1}{2}$

Hormone releasing IUDs - Increase phagocytosis of sperms, suppress sperm mobility, suppress the fertilising capacity of sperm, make the uterus unsuitable for implantation, make the cervix hostile to the sperms (**Any two**) =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 = 2 Marks]

**11. If you squeeze a seed of orange you might observe many embryos of different sizes. How is it possible ? Explain.**

Ans Some of the nucellar cells, surrounding embryo sac divide, protrude into the embryo sac, develop into the embryos thus each seed contains many embryos of different sizes =  $\frac{1}{2} \times 4$

[ $\frac{1}{2} \times 4 = 2$  Marks]

**12. A recombinant DNA is formed when sticky ends of vector DNA and foreign DNA join. Explain how the sticky ends are formed and get joined.**

Ans Restriction enzymes cut the DNA sequence a little away from the centre of the palindrome site but between the same two bases on the opposite strands, leaving single stranded portions at the ends these over hanging stretches are called sticky ends on each strand. They form hydrogen bonds with the complementary cut counterparts, facilitates the action of ligase enzymes to join the foreign and the vector DNA strands =  $\frac{1}{2} \times 4$

[ $\frac{1}{2} \times 4 = 2$  Marks]

**13. (i) Mention the number of primers required in each cycle of polymerase chain reaction (PCR). Write the role of primers and DNA polymerase in PCR.**

**(ii) Give the characteristic feature and source organism of the DNA polymerase used in PCR.**

Ans (i) 2 sets of primers, DNA polymerisation / extends the primers using the nucleotides =  $\frac{1}{2} + \frac{1}{2}$

(ii) Thermostable / remain active during high temperature induced denaturation of DNA,  
*Thermus aquaticus* =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 = 2 Marks]

**14. Define the term 'health'. Mention any two ways of maintaining it.**

OR

**Why does a doctor administer tetanus antitoxin and not a tetanus vaccine to a child injured in a roadside accident with a bleeding wound ? Explain.**

Ans State of complete physical mental and social well being = 1  
Balance diet , personal hygiene / regular exercise (**Any two**) =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 = 2 Marks]

OR

Tetanus is a deadly disease requiring a quick immune response, so preformed antibodies are injected directly = 1 + 1

[2 Marks]

**15. Giving two reasons explain why there is more species biodiversity in tropical latitudes than in temperate ones.**

Ans • Remain relatively undisturbed for millions of years so longer time for diversification  
• Less seasonal / more constant / predictable weather  
• More solar energy available for productivity  
(**Any two**) = 1 + 1

[1 + 1 = 2 Marks]

**16. Name an opioid drug and its source plant. How does the drug affect the human body ?**

Ans Heroin (smack) / morphine =  $\frac{1}{2}$   
Poppy plant / *Papaver somniferum* =  $\frac{1}{2}$   
Binds with opioid receptors in CNS / gastro intestinal tract , and slows down the system / depressent  
=  $\frac{1}{2} + \frac{1}{2}$

[  $\frac{1}{2} + \frac{1}{2} + 1 = 2$  Marks]

**17. Mention the major cause of air pollution in metro cities. Write any three ways by which it can be reduced.**

Ans Automobiles =  $\frac{1}{2}$   
Using catalytic converters, application of stringent pollution level norms, switching over to CNG as fuel, phasing out old vehicles, using unleaded petrol, using low sulphur petrol or diesel  
(**Any three**) =  $\frac{1}{2} \times 3$

[ $\frac{1}{2} + 1\frac{1}{2} = 2$  Marks]

**18. How did Eli Lilly synthesise the human insulin ? Mention one difference between this insulin and the one produced by the human pancreas.**

Ans Produce proinsulin chain A and chain B using separate DNA sequences introduced in the plasmids of *E.coli*, extracted, combined by disulphide bond produces mature insulin =  $\frac{1}{2} \times 3$   
Insulin produced by human pancreas has an additional C peptide =  $\frac{1}{2}$

[ $1\frac{1}{2} + \frac{1}{2} = 2$  Marks]

SECTION C

Q.Nos. 19 - 27 are of 3 marks each.

19. (i) Write the characteristic features of anther, pollen and stigma of wind pollinated flowers.  
(ii) How do flowers reward their insect pollinators ? Explain.

Ans (i) Pollen - light / large number / non sticky,  
Anther – well exposed  
Stigma - large / feathery / open / sticky =  $\frac{1}{2} \times 3$   
(ii) Provides nectar / food for the larvae / pollen grains / safe place to lay eggs  
(Any three) =  $\frac{1}{2} \times 3$

[  $1\frac{1}{2} + 1\frac{1}{2} = 3$  Marks]

20. (i) Why are grasshopper and *Drosophila* said to show male heterogamity ? Explain.  
(ii) Explain female heterogamity with the help of an example.

Ans (i) In grasshopper males have one X only (XO type) , in *Drosophila* males have one X and one Y (XY type) - Males in both produce 2 different kinds of gametes so heterogametic  
=  $\frac{1}{2} + \frac{1}{2} + 1$   
(ii) In birds female has ZW, produce two kinds of gametes and so heterogametic =  $\frac{1}{2} + \frac{1}{2}$

[2 + 1 = 3 Marks]

21. In a series of experiments with *Streptococcus* and mice F. Griffith concluded that R-strain bacteria had been transformed. Explain.

Ans S strain bacteria when injected - mice die , R - mice live , heat killed S - mice live , heat killed S + live R - mice die , recovered living S from dead mice , R strain bacteria had been transformed to S strain by the genetic material of heat killed S strain =  $\frac{1}{2} \times 6$

[ $\frac{1}{2} \times 6 = 3$  Marks]

22. (a) How does the Hardy - Weinberg's expression ( $p^2 + 2pq + q^2 = 1$ ) explain that genetic equilibrium is maintained in a population ?

(b) List any two factors that can disturb the genetic equilibrium.

Ans (a) Gene frequencies in a population are stable, constant from generation to generation, until some change in frequency happens, due to some factor =  $\frac{1}{2} \times 4$   
(b) gene migration / gene flow / gene drift / mutation / genetic recombination / natural selection  
(Any two) =  $\frac{1}{2} \times 2$

[2 + 1 = 3 Marks]

23. Mention the name of the causal organism, symptoms and the mode of transmission of the disease Amoebiasis.

Ans *Entamoeba histolytica* =1  
Constipation / abdominal pain / cramps / mucous stool / stool with blood clots (Any two)  
=  $\frac{1}{2} + \frac{1}{2}$

Houseflies carrier from faeces to person via food products / contaminated water = 1

[1 + 1 + 1 = 3 Marks]

24. (i) **Mention the property that enables the explants to regenerate into a new plant.**  
(ii) **A banana herb is virus-infected. Describe the method that will help in obtaining healthy banana plants from this diseased plant.**

Ans (i) Totipotency = 1

(ii) Extract the disease free meristem, in vitro culture to get virus free plants = 1 + 1

[1 + 2 = 3 Marks]

25. **Mention the product and its use produced by each of the microbes listed below :**

(i) *Streptococcus*

(ii) *Lactobacillus*

(iii) *Saccharomyces cerevisiae*

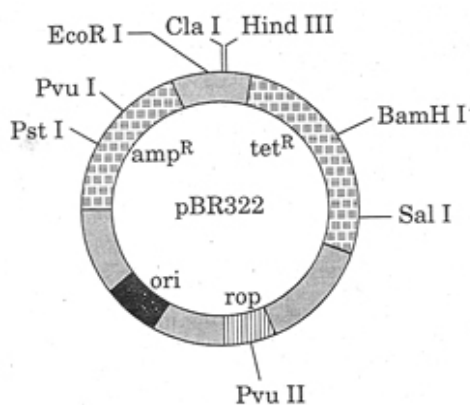
Ans (i) Streptokinase, clotbuster / dissolves clot from blood vessels =  $\frac{1}{2} + \frac{1}{2}$

(ii) Lactic acid, coagulates milk/partial digestion of milk proteins =  $\frac{1}{2} + \frac{1}{2}$

(iii) Ethyl alcohol + CO<sub>2</sub>, ferments dough to make bread / idli =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 + 1 = 3 Marks]

26. (i) **Name the organism in which the vector shown is inserted to get the copies of the desired gene.**  
(ii) **Mention the area labelled in the vector responsible for controlling the copy number of the inserted gene.**  
(iii) **Name and explain the role of a selectable marker in the vector shown.**



OR

**Name the insect pest that is killed by the products of cry I Ac gene. Explain how the gene makes the plant resistant to the insect pest.**

- Ans (i) *Escherichia coli* / *E.coli* = 1  
(ii) ori = 1  
(iii) amp<sup>R</sup> is the marker gene that helps in identification and elimination of the non transformant growing in ampicillin medium / selectively permitting the growth of the transformant resistant to ampicillin = 1  
// tet<sup>R</sup> is the marker gene that helps in identification and elimination of the non transformant growing in tetracycline medium / selectively permitting the growth of the transformant resistant to tetracycline = 1

[ 1 + 1 + 1 = 3 Marks]

OR

*Meloidogyne incognita* = 1

The gene ( cry IAc ) produces crystals of insecticidal protein which is inactive protoxin, when the bollworm eats the protoxin the alkaline pH of the gut activates it , activated protoxin binds to the midgut epithelial cells , creates pores / causes swelling / causes lysis / kills the worm =  $\frac{1}{2} \times 4$

[1 + 2 = 3 Marks]

**27. How do organisms like fungi, zooplanktons and bears overcome the temporary short-lived climatic stressful conditions ? Explain.**

- Ans Fungi - produce thick walled spores to survive unfavourable condition = 1  
zooplanktons - diapause to suspend development = 1  
bear – undergo hibernation in winter = 1

[1 + 1 + 1 = 3 Marks]

#### SECTION D

Q.Nos. 28 - 30 are of 5marks each.

**28. Describe in sequence the events that lead to the development of a 3-celled pollen grain from microspore mother cell in angiosperms.**

OR

- (a) Give a schematic representation showing the events of spermatogenesis in human male.  
(b) Describe the structure of a human sperm.

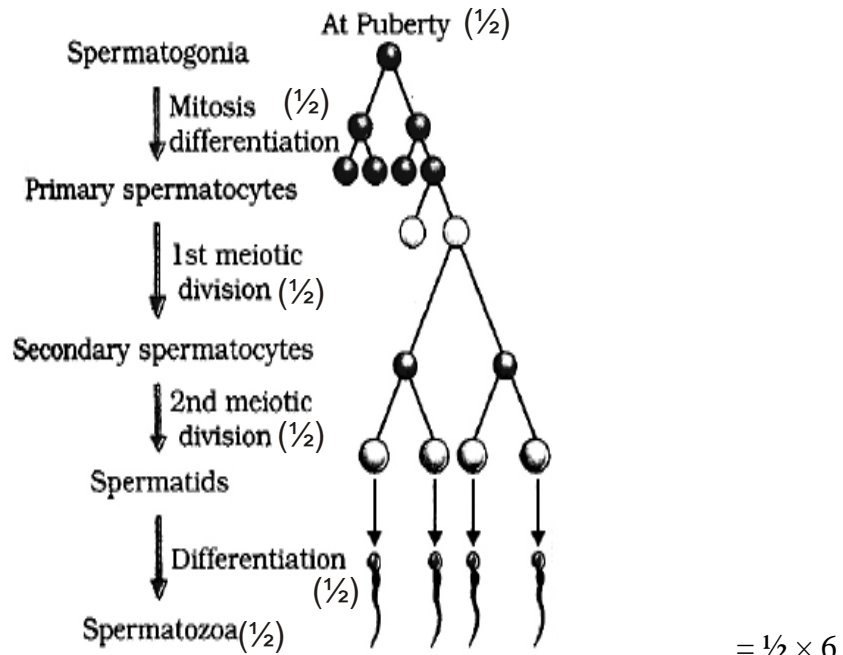
- Ans Microspore mother cell , meiosis , 4 haploid microspores , tetrad , Each microspore is a pollen grain , with two layered wall - outer exine (made of sporopollenin) and inner intine (made up of cellulose and pectin), pollen grain contain one larger vegetative cell , and a smaller generative cell , which divides mitotically , into two male gametes =  $\frac{1}{2} \times 10$

[ $\frac{1}{2} \times 10 = 5$  Marks]

OR



(a)



- (b) Sperm – enveloped by plasma membrane  
Head – haploid nucleus , acrosomes with enzymes  
Middle piece – with mitochondria  
tail =  $\frac{1}{2} \times 4$

// If illustrated with the above labellings correctly - marks to be awarded

[ 3 + 2 = 5 Marks]

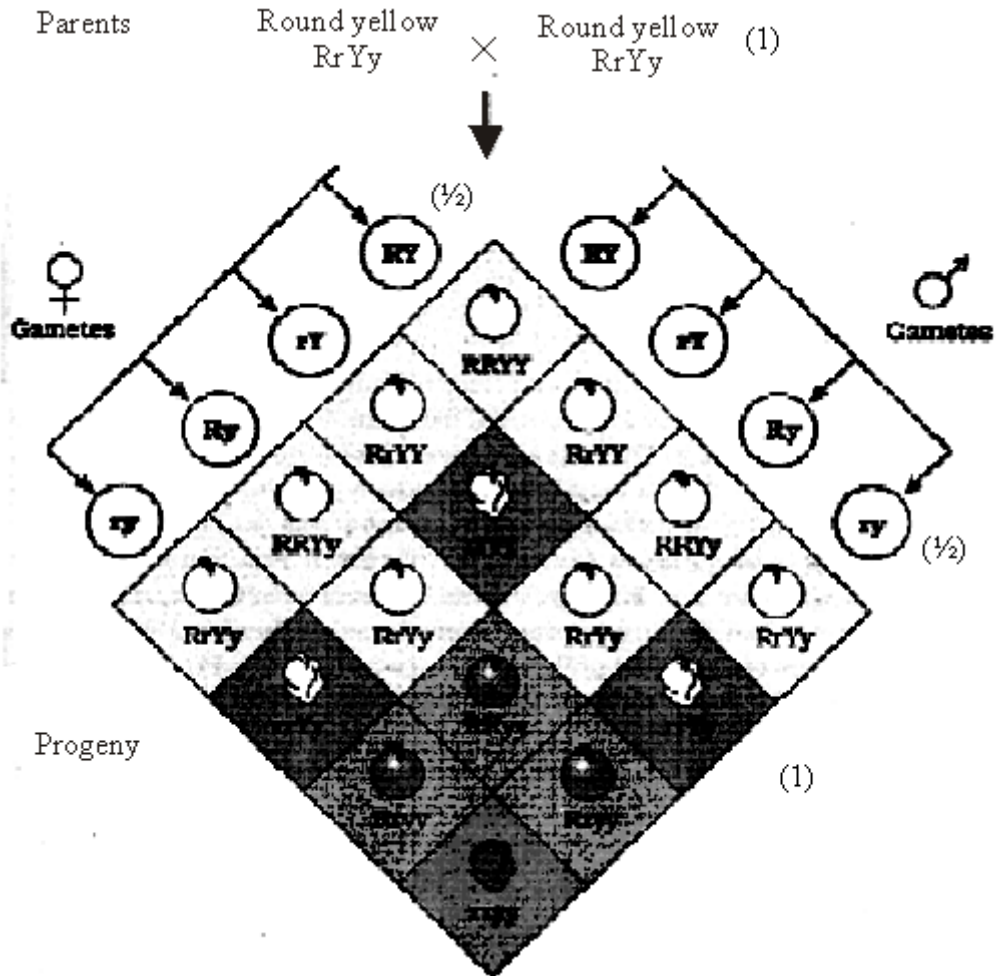
29. (a) State the law of independent assortment.  
(b) Using Punnett Square demonstrate the law of independent assortment in a dihybrid cross involving two heterozygous parents.

OR

**How did Alfred Hershey and Martha Chase arrive at the conclusion that DNA is the genetic material ?**

- Ans (a) When two pairs of traits are combined in a hybrid, segregation of one pair of character is independent of the other pair of characters = 1

(b)



Both parental type and recombinant types are observed to show that genes for the colour and genes for the shape of seeds segregate independently during gamete formation = 1

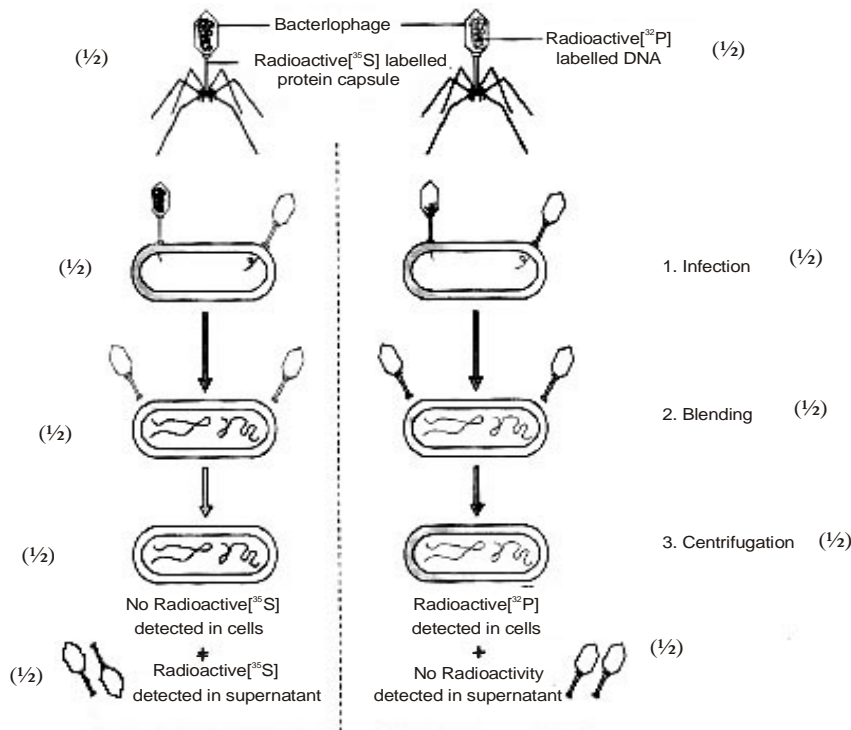
[ 1 + 3 + 1 = 5 Marks]

OR

Hershey and Chase grew some viruses in a medium that contained  $^{32}P$  radioactive phosphorus , these were allowed to infect *E. coli*, medium was agitated in a blender viral coats and the bacterial cells with viral particles were separated by spinning them in a centrifuge, in this case no radioactivity in the supernatant as the protein coats do not incorporate  $^{32}P$  , but the viral DNA had  $^{32}P$  and passed to it to the bacterial cell , so radioactivity was detected in the cells, proves that DNA is the hereditary material , They repeated the procedure with radioactive sulphur  $^{35}S$  , in this case no radioactivity was detected in the bacterial cell as S is not incorporated in DNA, while radioactivity was detected in the supernatant with protein coats of viruses =  $\frac{1}{2} \times 10$

[ $\frac{1}{2} \times 10 = 5$  Marks]

// **The following diagrammatic representation can be considered in lieu of the above explanation.**



[ $\frac{1}{2} \times 10 = 5$  Marks]

30. (a) **Why are herbivores considered similar to predators in the ecological context? Explain.**
- (b) **Differentiate between the following interspecific interactions in a population :**
- (i) **Mutualism and Competition**
  - (ii) **Commensalism and Amensalism**

**OR**

- (a) **Trace the succession of plants on a dry bare rock.**
- (b) **How does phosphorus cycle differ from carbon cycle ?**

Ans (a) Transfer of energy fixed by plants to the next trophic level - carnivores,  
Maintain the plant population under control =  $\frac{1}{2} + \frac{1}{2}$

- (b) (i) In mutualism both the species benefit = 1  
In competition - survival of both challenged / struggle for existence = 1
- (ii) Commensalism – One is benefitted. The other is neither benefitted nor harmed = 1  
Amensalism – One is harmed and the other is unaffected = 1

[1 + 4 = 5 Marks]

**OR**

- (a) Primary succession - lichens , secrete acids to cause weathering of rock and soil formation ,  
Small plants like bryophytes , to hold the soil ,  
Herbs , scrubs , shrubs succeed in existence ,  
Trees, forest , climax community =  $\frac{1}{2} \times 8$
- (b) – No respiratory release of phosphorus unlike  $\text{CO}_2$  in carbon cycle / No gaseous exchange  
– Inputs of phosphorus through rainfall is less than carbon input =  $\frac{1}{2} + \frac{1}{2}$

[ 4 + 1 = 5 Marks]

# BIOTECHNOLOGY

*Time allowed : 3 hours*

*Maximum Marks : 100*

## **General Instructions:**

- (i) *All questions are compulsory.*
- (ii) *There is no overall choice. However, an internal choice has been provided in one question of three marks and two questions of five marks. You have to attempt only one of the choices in such questions. Question paper contains four sections - A, B, C and D.*
- (iii) *Questions number 1 to 5 are very short answer questions, carrying 1 mark each.*
- (iv) *Questions number 6 to 15 are short answer questions, carrying 2 marks each.*
- (v) *Questions number 16 to 25 are also short answer questions, carrying 3 marks each.*
- (vi) *Questions number 26 to 28 are long answer questions, carrying 5 marks each.*
- (vii) *Use of calculators is not permitted. However, you may use log tables, if necessary.*

## **QUESTION PAPER CODE 99/1**

### **SECTION A**

1. Why is humulin considered better than pig insulin for the treatment of diabetes? 1
2. If a researcher began with a sample that contained 5 copies of double stranded DNA, how many copies would he be able to get after 20 cycles of PCR ? 1
3. What are interferons? 1
4. In isolating recombinant insulin from a culture of *E.coli*, the cells were filtered and the filtrate was subjected to a purification protocol. However no insulin was obtained. Why? 1
5. Why is erythropoietin (EPO) included in the list of banned substances for sportsmen? 1

## SECTION - B

6. In a batch culture of *E.coli*, specific growth rates of the microbial cells will be maximum at which phase of growth and why? 1+1 = 2
7. Compared to a conventional plasmid, what additional sequences are required in a YAC vector so that it can behave as an artificial chromosome? 2
8. Why is it useful to search a database to identify newly determined DNA sequence? Give two reasons. 2
9. Why is foaming caused during fermentation process? How can this be harmful to the process? 1 + 1 = 2
10. What is a transgenic plant? Enlist two examples of transgenic plants with beneficial traits. 2
11. Patients who are administered monoclonal antibodies against CD3 can accept renal allograft, why? 2
12. Listed below are four different single strands of DNA. Which of these in their double stranded form, would you expect to be cleaved by a restriction endo-nuclease, and why?
- (a) GCCTCATTCTGAAGCCTGA
- (b) ACTCCAAGCTTCACTCCG
- (c) CTCGCCAGACTCGTCGCA
- (d) ACTCCACTCCCGACTCCA 2
13. (a) Expand 'BLAST'.  
(b) When aligning two or more genetic sequences, it is sometimes necessary to insert gaps, why? 2
14. How are novel genes introduced into plants using Ti plasmid of *Agrobacterium*? Enlist major steps.  $\frac{1}{2} \times 4 = 2$

15. A soil microorganism produces a novel metabolite in nanomolar (nM) concentration. Suggest any two ways to increase its production. 2

### SECTION - C

16. What is 'Molecular Pharming'? Why is it more advantageous compared to production in a bacterial system? Give any four reasons.  $1 + \frac{1}{2} \times 4 = 3$
17. DNA microarray permits an investigator to monitor simultaneously, the level of mRNA production from every gene in an eukaryotic organism.
- (i) Why might such an analysis not give an accurate estimate of the level of protein expressed in an organism?
- (ii) Which alternative technique will be better suited for the above mentioned analysis? 3
18. List three *differences* between a batch and a continuous culture. 3
19. What are the potential risks (any three) and benefits (any three) of GM crops? 3
20. Why is it difficult to culture animal cells as compared to plant or microbial cells? Why is it essential to supplement animal cell culture media with serum? 3

### OR

- Why are animal cells grown in CO<sub>2</sub> incubators and not in regular incubators? Give three reasons. 3
21. (i) What are essential amino acids?
- (ii) Athletes are recommended to consume Branched Chain Amino Acids (BCAA) before and after exercise. How does this practice benefit them? 3
22. What is a recombinant vector? How is it constructed? 3
23. How can you obtain virus-free sugarcane plants from virus-infected plants? Are these plants virus-resistant? Why or Why not? 3
24. Embryonic stem (ES) cells could potentially be used to treat a variety of diseases

associated with cell and tissue damage. Defend this statement by giving three examples of ES therapeutics.

3

25. Study the following purification table and answer the questions that follow:

Steps	Procedure	Total protein (mg)	Activity (units)
Step 1	Crude extract	15,000	150,000
Step 2	Salt fractionation	4,000	138,000
Step 3	Ion exchange chromatography	1,500	115,500
Step 4	Size exclusion chromatography	68.8	75,000
Step 5	Affinity chromatography	1.75	52,000

(i) Which step in the purification is most effective, and why?

(ii) Which of the procedure is least effective and why?

3

#### SECTION - D

26. (a) What do you understand by 'SNPs'? Suggest any two applications.

(b) Name any two databases important in bioinformatics. Mention the type of information which may be obtained from these databases.

3 + 2 = 5

27. (i) What is meant by proteomics ?

(ii) Name three important types of proteomics.

(iii) Why is the proteome of a given species larger than its genome? Give two reasons.

$1\frac{1}{2} + 1\frac{1}{2} + 2 = 5$

#### OR

Name the technique developed by O'Farrel. Schematically depict the key steps in the separation of proteins using this technique. Highlight the basis of separation at each step.



28. (i) Schematically illustrate the technique of 'site-directed mutagenesis'.
- (ii) What physical and chemical properties of naturally occurring enzymes might be useful to change by site directed mutagenesis?

**OR**

Explain the principle and steps involved in the Sanger's method of DNA sequencing. 5

**QUESTION PAPER CODE 99**

**SECTION A**

1. Protein chemists prefer to monitor absorbance of protein fractions eluting from a chromatographic column at 280 nm. Why? 1
2. If a researcher began with a sample that contained three copies of double stranded DNA, how many copies would he be able to generate after 27 cycles of PCR ? 1
3. What are monoclonal antibodies? 1
4. Recombinant human insulin cannot be obtained from the culture filtrate of *E.coli*. Why? 1
5. Why are long distance runners disqualified if they test positive for high amounts of erythropoietin (EPO) ? 1

**SECTION - B**

6. Most media that are used for culturing microbes within laboratories are not used for large scale cultivation. Why ? 2
7. If you wanted to express a eukaryotic protein in bacterial cells, would you clone genomic DNA or cDNA into the expression vector? Justify your choice. 2
8. What are homologous sequences? How can you access information on homologous genes/sequences? 2
9. Why is aeration important for microbial growth? How can proper aeration be achieved in microbial cultures grown under laboratory conditions ? 2

10. Differentiate between primary and secondary metabolites. Name two secondary metabolites obtained through tissue culture and their application in medicine. 2
11. Monoclonal antibody against CD3 is an effective therapeutic agent in overcoming renal allograft rejection. Why ? 2
12. Listed below are four different single strands of DNA. Which of these in their double stranded form would you expect to be cleaved by a restriction endonuclease and why? 2
- (a) ACTCCAGAATTCACTCCG
- (b) ACTCCACTCCCGACTCCG
- (c) GCCTCATTCGAAGCCTGA
- (d) GAGCGGTTTATCTGAGCAG
13. (a) Expand 'EMBL'.  
(b) Why is it necessary to insert gaps when aligning two or more genetic sequences? 2
14. Which plant part(s) would be best suited for expressing antigens and why? 2
15. A fungal extract has anti-cancer potential and it has shown positive results in clinical trials against childhood leukemia. However, the active compound is present in very low concentration. Suggest any two ways to increase its production. 2

### SECTION - C

16. What is 'Molecular Pharming' ? Suggest any four advantages of expressing transgenic proteins in milk. 3
17. Suggest any four methods used for introduction of recombinant DNA into host cells. Also explain the method of insertional inactivation used for identification of the recombinants. 2+1
18. What is a 'fed-batch' culture? What are its benefits in microbial technology ? 3

19. What are the major constraints in accepting transgenic crops? 3
20. (i) Briefly explain what is meant by 'contact inhibition'.  
(ii) What is the difference between a defined and a serum-supplemented medium? 3

**OR**

- (i) Differentiate between anchorage-dependent and anchorage-independent cells.
- (ii) How is damage to cells prevented during cryopreservation ?
21. (i) Give any two applications of proteolytic enzymes.  
(ii) How does the consumption of branched chain amino acids (BCAA) help athletes in enhancing their performance? 3
22. What information can be obtained from genome sequencing projects? 3
23. How can you obtain virus-free potato plants from virus-infected plants? Are these plants virus-resistant? Why or why not? 3
24. How could embryonic stem (ES) cells potentially be used for treatment of diseases associated with tissue damage? Give two examples. 1+2 = 3
25. Study the following enzyme purification table and answer the questions that follow:

Steps	Procedure	Total protein (mg)	Activity (units)
Step 1	Crude extract	10,000	1,00,000
Step 2	Salt fractionation	3,000	96,000
Step 3	Ion exchange chromatography	400	80,000
Step 4	Size exclusion chromatography	300	60,000
Step 5	Affinity chromatography	3	45,000

- (a) Which step in the purification is most effective and why?
- (b) Which of the procedures is least effective and why? 3

**SECTION - D**

26. (i) What are the essential features of a vector?
- (ii) What is the role of cos sites in phage  $\lambda$  ?
- (iii) What is the role of DNA ligase and alkaline phosphatase in recombinant DNA technology ? 5
27. (i) What is isoelectric focussing?
- (ii) Name some of the important branches of proteomics.
- (iii) Why is the study of proteome relevant in the age of genomics ? 5

**OR**

What is the principle of protein fingerprinting? Enlist major steps for performing this technique. Suggest one application of this technique for detection of human disease.

28. Expand NCBI. What are the possible uses (any two) of databases available in NCBI ? How can tools available in these databases be used to retrieve and compare genetic information? 5

**OR**

Gene prediction for a given genome using bioinformatic tools may be different from the actual number of genes identified by experimental methods. Why is it so ? Do you think there is always a correlation between the complexity of the organism and total number of genes present in its genome? Justify with suitable example.

## Marking Scheme — Biotechnology

### General Instructions :

#### *The Marking Scheme and mechanics of marking*

1. All awarded marks are to be written in the left hand margin at the end of the question or its part.
2. Place a tick (✓) in red directly on the key/operative term or idea provided it is in correct context. Place “Half-tick” ½ wherever there is ½ mark in the marking scheme. (Do not place tick indiscriminately just to show that you have read the answer).
3. If no marks are awarded to any part or question put a cross (×) at incorrect value portion and mark it zero (in words only).
4. Add up ticks or the half ticks for a part of the question, do the calculation if any, and write the part total or the question total in the left hand margin.
5. Add part totals of the question and write the question total at the end. Count all the ticks for the entire question as a recheck and draw a circle around the question total to confirm correct addition.
6. If parts have been attempted at different places do the totalling at the end of the part attempted last.
7. If any extra part is attempted or any question is reattempted, score out the last one and write “extra”.
8. In questions where only a certain number of items are asked evaluate only that many numbers in sequence as is asked ignoring all the extra ones even if otherwise correct.
9. Transcribe the marks on the cover page. Add up question totals. Recheck the script total by adding up circled marks in the script.
10. Some of the questions may relate to higher order thinking ability. These questions will be indicated to you separately by a star mark. These questions are to be evaluated carefully and the students' understanding / analytical ability may be judged.
11. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been carried out as per the instruction given in the marking scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.

QUESTION PAPER CODE 99/1  
**EXPECTED ANSWERS/VALUE POINTS**  
**SECTION A**

- Q1. Humulin acts faster/Incidence of allergic reaction is reduced. 1
- Q2.  $(5 \times 2)^{20} = 10^{20}$  1
- Q3. Interferons are proteins secreted by virally infected cells and interfere with viral propagation. 1
- Q4. Recombinant insulin is expressed intracellularly, hence no insulin is in the culture filtrate. 1
- Q5. EPO enhances performance of athletes because it stimulates RBC production, which increases oxygen carrying capacity, aerobic metabolism; hence it is banned. 1

**Section- B**

- Q6. Specific growth rate is maximum during exponential/ log phase. 1
- Availability of nutrients allows cells to divide rapidly till stationary phase. 1
- Q7. YACs contain teleomeric and centromeric sequences which enable it to behave as an artificial chromosome. 1 + 1=2
- Q8. To identify genes, their functions, regulatory sequences and to infer phylogenetic relationships (any two). 1 + 1= 2
- Q9. Foaming is caused by proteins/components of media/metabolites produced by microbes (any one). 1
- Foaming can denature proteins/cut oxygen supply/microbes trapped in foam cannot grow (anyone) 1
- Q10. A transgenic plant has DNA/genes from another organism introduced through recombinant DNA technology. 1
- Any two examples- Bt cotton, Flavr Savr tomatoes, Golden rice, edible vaccines.  $\frac{1}{2} + \frac{1}{2} = 1$

- Q11. T cells play a major role in graft rejection.  
OKT-3 targets CD3 surface marker on T cells removing them from circulation and hence graft is not rejected. 1 + 1 = 2
- Q12. Options (a) GCCTCATTCGAAGCCTGA  
and (b) ACTCCAAGCTTCACTCCG  $\frac{1}{2} + \frac{1}{2} = 1$   
Restriction enzymes recognise palindromic sequences. 1
- Q13. BLAST: Basic Local Alignment Search Tool. 2  
Gaps are inserted to align sequences of unequal length but sequence similarities.
- Q14. Use leaf discs/embryonic callus; Infect with recombinant disarmed Ti plasmid; co-cultivation to facilitate transfer; selection and regeneration medium; induce rooting; hardening and transfer to soil. 2
- Q15. Strain improvement techniques; classical genetic techniques/mutant selection; genetic engineering. 1+1=2

### Section - C

- Q16. To create transgenic animals by direct microinjection of DNA into ova or stem cells and produce insulin and other proteins in milk on a commercial scale. 1  
Any four advantages over using bacteria- large amounts of source, functionally active proteins being produced in mammals, ease of collecting milk, ease of production, moderate capital investment.  $\frac{1}{2} \times 4 = 2$
- Q17. (i) Levels of mRNA are not necessarily correlated with protein production. 1½  
(ii) 2-D gel electrophoresis/proteomics can assess the total proteins actually expressed. 1½
- Q18. Batch culture Continuous culture  
1. Closed culture system open culture system  
2. Has limited amount of nutrients nutrients are replenished

3.	Organism shows normal growth kinetics	cells are grown for extended time	
4.	Organisms are exposed to continually changing environment.	chemical environment is constant	
	Any three		1+1+1=3
Q19.	Risks, any three from pg. 136.		1½
	Benefits, any three from, pg.128-134.		1½
Q20.	Animal cells have complex nutritional requirements, need CO <sub>2</sub> incubators, proper humidity conditions and grow only for limited generations.		1½
	Serum has essential growth factors, hormones and other components that support the growth of many cell types.		1½
<b>OR</b>			
	CO <sub>2</sub> incubators help to maintain :		
	Fixed levels of CO <sub>2</sub> and therefore pH; high humidity to prevent desiccation, maintain correct osmolarity and constant temperature.		1 x 3=3
Q21.	(i) Essential amino acids cannot be synthesised in the body and have to be obtained from the diet.		1
	(ii) BCAA are important for muscle growth. Their intake prevents the breakdown of muscle proteins during exercise. They can be processed to yield energy.		2
Q22.	Vector containing an insert is a recombinant vector.		1
	Vector and fragment containing gene are isolated and cut with same restriction enzyme; joined with DNA ligase to make recombinant vector/Fig. on Pg.55.		2
Q23.	Micropropagation using meristems.		
	No, these are not virus resistant.		
	Because meristems are virus-free but do not have resistance genes.		1+1+1=3



- Q24. ES cells have self renewal capacity and differentiating capability and therefore can be used to treat burn victims; repair of joints damaged by injury or arthritis; repair or replacement of liver etc. (any three) 1+1+1=3
- Q25. Step 5 most effective because of maximum increase in specific activity.  $\frac{1}{2} + 1 = 1\frac{1}{2}$
- Step 3 least effective because specific activity decreases from previous step.  $\frac{1}{2} + 1 = 1\frac{1}{2}$
- (Specific activity calculations can be allotted  $\frac{1}{2}$  mark for each part.)

### Section-D

- Q26. SNPs are single nucleotide polymorphisms. Applications- disease predictions and population genetics etc. on pg. 80-81 (any two) 1 + 2 =3
- Any two databases listed on pg.94- EMBL/SWISS-PROT /PDB/Ribosomal RNA database/PALI database and their use. 2
- Q27. (i) The entire protein complement of a cell/tissue/organism. 1½
- (ii) Structural proteomics; functional proteomics; expression proteomics 1½
- (iii) Proteins are more than genes due to alternate splicing/overlapping genes/post transcriptional and post translational modifications. 2

### OR

- 2-D gel electrophoresis. First dimension by isoelectric focussing and include principle and second dimension by SDS-PAGE with principle. Details/ diagram on pg.16&17. 1+2+2=5
- Q28. (i) Diagram on pg.68, fig.14. 3
- (ii) Thermal stability; resistance to denaturation by organic solvents and extremes of pH; improving catalytic activity and modifying specificity. 2

### OR

Principle and details on pg. 64-66 (fig.11 & 12).

Include 4 sequencing mixtures, each containing DNA single strand, primer, DNA polymerase, NTPs and ddTTP/ddATP/ddGTP/ddCTP. 2

- The chain termination achieved due to the presence of dideoxy nucleotide triphosphate should be explained. 2
- Reading of the sequence from the autoradiogram should be indicated. 1

QUESTION PAPER CODE 99

**EXPECTED ANSWERS/VALUE POINTS**

**Section-A**

- Q1. Non-destructive, faster and simple method  $\frac{1}{2} \times 2 = 1$
- Q2.  $(3 \times 2)^{27} = 4 \times 10^8$  1
- Q3. Monoclonal antibodies are epitope specific. 1
- Q4. Recombinant insulin is intracellular; culture filtrate has no hormone. 1
- Q5. EPO is a performance enhancing hormone and hence banned. It stimulates RBC production increasing oxygen carrying capacity. 1

**Section-B**

- Q6. For large scale culturing media components should be economical, consistent quality, available all round the year and locally available (any two), 2
- Q7. cDNA. Bacterial systems cannot splice eukaryotic gene introns.  $1+1=2$
- Q8. Homologous sequences are derived from the same ancestral gene.  
Database retrieval tools- LOCUS links can be used.  $1 + 1 = 2$
- Q9. For efficient oxygen transfer, cell growth and mixing (any two).  
Shakers / baffle flasks.  $1 + 1 = 2$
- Q10. Primary metabolites are required for basic metabolism. Secondary metabolites are not essential.  
Any two examples from Table 1 on pg. 125.  $1+1=2$

Q11. T cells play a major role in graft rejection.

OKT-3 targets CD3 surface marker on T cells removing them from circulation and hence graft is not rejected.

1+1 = 2

Q12. Options (a) ACTCCAGAATTCACTCCG

(c) GCCTCA TTCGAAGCCTGA

Restriction enzymes recognise palindromic sequences.

1 + 1 = 2

Q13. European Molecular Biology Laboratory.

Gaps are inserted when comparing sequences which are similar but of unequal length.

1 + 1 = 2

Q14. Plant parts which are eaten raw such as tomatoes, banana etc.

Easy painless delivery system, low cost and no storage problems (any two).

1 + 1 = 2

Q15. Strain improvement techniques- Classical genetic techniques / mutant selection and genetic engineering techniques.

1 + 1 = 2

### Section - C

Q16. To create transgenic animals by direct microinjection of DNA into ova or stem cells and produce insulin and other proteins in milk on a commercial scale.

1

Advantages- high production capacity, ease of collection of source material, low operational cost/capital and ease of production.

$\frac{1}{2} \times 4 = 3$

Q17. Any four- transformation, transfection, electroporation, microinjection, biolistics and phage based vectors.

$\frac{1}{2} \times 4 = 2$

Any one method of insertional inactivation- loss of antibiotic resistance/ blue- white selection method as discussed on pgs. 58 & 59.

1

Q18. A fed batch culture is continuously or sequentially fed with fresh medium without removing the growing culture.

1

Benefits-increased production of intracellular metabolites; high cell density can be achieved.	2
Q19. Transgenic crops may cause allergies; they may affect biodiversity; allow horizontal transfer of antibiotic resistance genes; change evolutionary patterns. (any three from pg.136)	1x3 = 3
Q20. (i) The phenomenon which prevents cells from growing beyond confluence.	1
(ii) A defined medium has known chemicals, of fixed composition and can support growth of selected cells.	
Serum is an essential component of animal cell culture media and is a source of growth factors and hormones.	1+1 = 2
<b>OR</b>	
(i) Anchorage dependent cells grow as adherent cells whereas anchorage-independent cells grow as suspension cultures.	1½
(ii) By adding glycerol/DMSO/serum which prevent formation of ice crystals.	1½
Q21. (i) Any two applications- eg. - dissolving clots, food and beverage industry, soap/detergent industry, leather and textile industry etc.	½ + ½ = 1
(ii) BCAA are important for muscle building; These prevent the breakdown of muscle protein during exercise; They can be processed to provide energy (any two).	1 + 1 = 2
Q22. Any three points from pg.78- basis of discovery of all genes, relationship between genes, tools for further experimentation, an index to draw and organise information, serves as an archive for the future.	1x3 = 3
Q23. Micropropagation using meristems.	
No, these are not virus resistant.	
Because meristems are virus-free but do not have resistance genes.	1+1+1=3
Q24. ES cells have the capacity for self-renewal and differentiation.	1

Treatment of burn victims; repair of joints; replacement of liver etc. (any two).	1 + 1 = 2
Q25. (a) Step 5 most effective- maximum increase of specific activity.	$\frac{1}{2}+1 = 1\frac{1}{2}$
(b) Step 4 least effective- no increase in specific activity.	$\frac{1}{2}+1 = 1\frac{1}{2}$

### Section-D

Q26. (i) Essential features- origin of replication, selectable marker, restriction sites (any two).	2
(ii) cos sites important for packaging DNA into phage heads.	
(iii) DNA ligase-joins cut DNA strands (recombinant DNA); alkaline phosphatase prevents self ligation of vector.	1 + 1 = 2
Q27. (i) Separation of proteins based on their charge/isoelectric pH.	1
(ii) structural proteomics, functional proteomics, expression proteomics, proteome mining. (any two).	1 + 1 = 2
(iii) Proteins responsible for phenotype, proteins more in number than genes due to alternate splicing etc., proteome is dynamic, quantitative differences in protein expression etc. pg.37 (any two).	1 + 1 = 2

### OR

The principle of protein fingerprinting is to generate peptide maps after proteolytic cleavage and separation of the peptides.	1
Major steps- trypsin cleavage, electrophoresis, paper chromatography and visualisation.	3
Application- detection of sickle cell haemoglobin/ sickle cell anaemia.	1
Q28. National Centre for Biotechnology Information.	1
Uses- Comparison of genomes; Finding homology of unknown gene using BLAST.	2
Any two from pg. 92-93	2

**OR**

Proteins are more than genes due to alternate splicing/overlapping genes/post transcriptional and post translational modifications. 2

No correlation necessarily between complexity of organism and total number of genes. 1

Any example with justification as on pgs. 79 & 80. 1 + 1 = 2

# INFORMATICS PRACTICES

*Time allowed : 3 hours*

*Maximum Marks : 70*

## **Instruction:**

- (i) This question paper is divided into 3 sections.
- (ii) Section A consists of 30 marks.
- (iii) Section B and Section C are of 20 marks each.
- (iv) Answer the questions after carefully reading the text.

**QUESTION PAPER CODE NO. 90/1**

## **SECTION A**

Q1. Answer the following questions

- (a) Name **any** four application areas of business computing. 2
- (b) What are the following software used for? 2
  - (i) Python
  - (ii) Linux
- (c) Expand the terms OSI and GNU. 2
- (d) Mention any two types of relationships that can be set up between two relations. Explain the concept of ER Model using the case study of a Air Ticketing System that has three entities Ticket, Passenger and Flight. Assume that each passenger can buy more than one ticket. 4

Q2. Answer the following questions

- (a) Differentiate between the Do While.....Loop and Do.....Loop While loops of Visual Basic giving a suitable example of each. 2
- (b) Name and explain the usage of any two types of procedures available in Visual Basic. 2
- (c) What are data-bound controls? Name any two intrinsic data-bound controls that can be used on a form. 2

- (d) Explain the term ADO. Name and explain three different methods used to navigate through ADO recordsets. 4

Q3. Answer the following questions

- (a) Differentiate between TCL and DCL commands. Name one TCL and one DCL command. 2
- (b) Name the keyword used to: 2
- (i) Allow duplicate rows in a query.
  - (ii) Avoid duplicate rows in a query.
- (c) Mention any two limitations of SQL. 2
- (d) Define the terms Primary key and Alternate key with respect to a database. 2
- (e) Differentiate between Before and After type triggers. 2

### SECTION - B

Q4. Read the following case, study and answer the questions that follow:

Xtra Care Hospital has computerized its billing. A new bill is generated for each patient. The hospital allows four different types of patients to take admission. The daily charges are based on the type of patient. The following is the data entry screen used to generate the bill at the time of discharging the patient :

The screenshot shows a window titled "Patient Bill Form" for "Xtra Care Hospital". The form contains the following fields and controls:

- Patient Name:** A text input field.
- Patient Type:** A group box containing four radio buttons: "DPD", "ICU", "Private", and "Dormitory".
- Admission Date:** A date input field.
- No. of Days:** A numeric input field.
- Discharge Date:** A date input field.
- Daily Charges:** A numeric input field.
- Bill Amount:** A numeric input field.
- Buttons:** "Clear All", "Calculate", and "Exit" buttons are located at the bottom of the form.



The list of controls for the above form is as follows:

Object type	Object Name	Description
Form	FrmBili	The main form
Text Box	TxtPname TxtAdDate TxtDiDate TxtDays TxtCharge TxtAmt	To enter patient name To enter admission date To display discharge date as the system date To display number of days spent in hospital To enter the daily charges To display the final bill amount
Option Buttons	OptOPD OptICU OptPrivate OptDorm	To select patient type as OPD To Select patient type as ICU To select patient type as Private To select patient type as Dormitory
Command Button	CmdClear CmdCalc CmdExit	To clear all textboxes To calculate bill amount To Exit from the application

- (a) Write the code for the CmdClear command button to clear all the textboxes except the txtDiDate textbox. 1
- (b) Write the code for the form load event of FrmBill so as to: 2
- (i) Display the system date in the TxtDiDate textbox.
- (ii) Disable the TxtDiDate and the TxtDays textboxes.
- (c) Write the code for the change event of the TxtAdDate textbox to display the number of days the patient has spent in the hospital. The number of days should be calculated as discharge date - admission date. The code should also display a warning message the admission date is input as a date later than the discharge date. 3
- (d) Write the code for the CmdCalc command button to display the final bill amount in the TxtAmt textbox. Note that Final bill amount is calculated as: 4

(No. of Days\* Daily Charge)

The Daily Charges are calculated according to the following criteria:

Patient Type	Daily Charge
OPD	300
ICU	4000
Private	2000
Dormitory	1000

Q5. Answer the following questions

- (a) Find the errors from the following code segment and rewrite the corrected code underlining the correction made. 2

```
Sub Fibo (S1 As Integer, S2 As Integer, N As Integer)
Dimension count As Integer; term As Integer
Print S1
Print S2
For count = 3 Till N
    term = S1 + S2
    Print term
    S1 = S2
    S2 = term
Next Value
End Sub
```

- (b) Rewrite the following code using Select Case construct without affecting the output: 2

```
Dim a As Integer
a = 4
If a = 1 Then
    Print "Sunday"
Elseif a >= 2 and a <= 6 Then
```

```

        Print "WeekDay"
Elseif a = 7 Then
        Print "Nearing Weekend"
End If

```

- (c) Find the output of the following code: 2

```

Dim a as String
Dim I as Integer
a = "KANK"
I = Len (a)
Do
    Print Mid (a, I)
    I = I - 1
Loop While I > 0

```

- (d) Write a Visual basic function that takes two String arguments and compares the two strings. The function return 0 if both the arguments are equal. The function returns - 1 if the first argument is smaller than the second and 1 if the second argument is smaller then first. 4

### SECTION - C

Q6. Read the questions given below and answer accordingly:

- a) Write the output produced by the following PL/SQL code: 2

```

DECLARE
    A NUMBER;
    B NUMBER;
    TEMP NUMBER;
BEGIN
    FOR X IN 1..4 LOOP
        TEMP:= A;
        A := B;

```

```

        B := TEMP;

        A := A + 1;

        B := B-1;

        DBMS_OUTPUT . PUT_LINE ( 'A = ' || A );

        DBMS_OUTPUT . PUT_LINE ( 'B = ' || B );

    END LOOP;

END;

```

- (b) Find the errors from the following PL/SQL code and rewrite the corrected code underlining the correction made

**2**

```

DECLARATION

    V_MNO MOVIES.MOVIENO%TYPE;

    V_TITLE MOVIES.TITLE%TYPE;

    V_PRICE MOVIES.PRICE%TYPE;

BEGIN

    V_MNO EQUALS 101

    LOOP

        SELECT TITLE, PRICE, RATING INTO V_TITLE,
        V_PRICE, V_RATE FROM MOVIES

        WHERE MOVIENO = V_MNO;

        DBMS_OUTPUT.PUTTEXT(V_TITLE || ' ' || V_PRICE);

        EXIT WHEN V_RATE<4;

        V_MNO:= V_MNO + 1;

    LOOP END;

END;

```

- (c) Differentiate between the OUT and IN OUT modes of a parameter in a PL/SQL block.
- (d) Write a PL/SQL Function CheckDiv that takes two numbers as arguments and returns that value 1 if the first argument passed to it is divisible by the second argument else it should return the value 0.

**2**

**4**

Q7. Answer the questions based on the table Apartment given below:

**Table: Apartment**

Column Name	Data Type	Size	Constraint	Description
A_No	NUMBER	4	PRIMARY KEY	Apartment number
A_Cat	CHAR	1	'D' or 'S'	Apartment category as Delux or SuperDelux
Pur_Name	VARCHAR2	30		Name of the purchaser
A_Cost	NUMBER	8.2		Cost of apartment
Dt_Sold	DATE			Date of Selling

- (a) Write the SQL command to create table Apartment including the constraints. 2
- (b) Write the SQL command to display the category and number of apartments in each category. 2
- (c) Write the PL/SQL code to increase the apartment cost by 5% for an apartment number accepted as parameter and display the updated details. 3
- (d) Write the PL/SQL code to create a stored procedure NOTSQLD to display the details of all the apartments which have not been sold. The code should also display the total cost of all such apartments. 4

**QUESTION PAPER CODE NO. 90**

**SECTION A**

Q1. Answer the following questions

- (a) Expand the terms OSS and W3C. 2
- (b) What are the following software used for? 2
- (i) PHP
- (ii) MySQL
- (c) Name any four application areas of databases. 2
- (d) What are the different types of relationships that can be depicted through an ER model? Explain the concept of ER Model using the case study of a Ticket

Reservation System that has three entities Ticket, Passenger and Train. Assume that each passenger can buy more than one ticket. 4

Q2. Answer the following questions

- (a) Differentiate between the FOR ... NEXT and FOR EACH ... NEXT loop of Visual Basic giving a suitable example of each. 2
- (b) Name and explain the usage of any two types of modules available in Visual Basic. 2
- (c) What are data-aware controls? Name any two ActiveX data aware controls that can be used on a form 2
- (d) Explain the term ADO object model. Differentiate between the Connection Timeout and Command Timeout properties of. the Connection object. 2

Q3. Answer the following questions

- (a) Differentiate between row-level and statement-level triggers. 2
- (b) Define the terms Candidate key and Foreign key with respect to a database. 2
- (c) Differentiate between DDL and DML commands. Give one example of each type of command 2
- (d) Mention any two advantages of PL/SQL as compared to SQL. 2
- (e) Name the keyword used to 2
  - (i) Allow duplicate rows in a query.
  - (ii) Avoid duplicate rows in a query.

### SECTION - B

4. Read the following case study and answer the questions that follow:

Mr. Presi of Super Store decided to computerize the billing department. The accounts manager at Super Store is creating billing software to generate the bill during the sale period. A new bill is generated for each item sold. The discount is given based on the item category. An additional discount of 5% is given to the Store Membership Card holders. The following is the data entry screen used at the store:

The list of controls for the above form is as follows:

Object Type	Object Name	Description
Form	FrmBill	The main form
Text Box	TxtBillno	To enter Bill Number
	TxtBillDate	To display System Date
	TxtIName	To input Item Name
	TxtPrice	To input Item Price
	TxtDisc	To display Discount
	TxtFinal	To display Final Price
Option Buttons	OptMens	To select Men's Category
	OptWomens	To Select Women's Category
	OptKids	To select Kid's Category
Command Button	ChkMember	To be checked for members
	CmdCalc	To calculate discount and Final Price
	CmdClear	To clear all textboxes
	CmdExit	To Exit from the application

- (a) Write the code for the CmdClear command button to clear all the textboxes except the TxtBillDate textbox

- (b) Write the code for the form load event of FrmBill so as to: 2
- (i) Display the system date in the TxtBillDate textbox.
- (ii) Disable the TxtBill Date, TxtDisc and TxtFinal textboxes
- (c) Write the code for the change event of the TxtPrice textbox to ensure that the user does 'not enter a negative or a zero value. If a negative or a zero value is entered then the textbox should be made blank and a warning message should be displayed. 3
- (d) Write the code for the CmdCalc command button to display the discount and final price in the TxtDisc, and TxtFinal textboxes respectively. Note that Final price is calculated as price - discount and the discount is calculated based on the category and price according to the following table. Also remember to give an additional 5% discount for membership card holders i.e. if the ChkMember check box is checked. 4

Category	Price	Discount
Men's	<1000	30%
	>=1000	50%
Women's	<1500	40%
	>=1500	50%
Kid's	<500	20%
	>=500	30%

Q5. Answer the following questions

- (a) Find the errors from the following code segment and rewrite the corrected code underlining the correction made. 2

```
Private Function IsPrime (num As Integer) As Bool
Dim limit As Integer
limit = num / 2
FOR ctr = 2 TO limit
    If num Modulo ctr = 0 Then
        Exit For loop
```



```

        End If
    Next
    IsPrime = IIf(ctr > limit, True, False)
End Sub

```

- (b) Find the output of the following code: 2

```

Dim astr as string
Dim I as Integer
I = 1
astr = "Come"
Do while I <= Len (astr)
    Print Mid (astr, I)
    I = I + 1
LOOP

```

- (c) Rewrite the following code using If Then Else construct without affecting the output: 2

```

Dim a As Integer
a = 1
Select Case a
    Case 1
        Print "Sunday"
    Case 2 To 6
        Print "WeekDay"
    Case 7
        Print "Nearing Weekend"
End Select

```

- (d) Write a Visual Basic procedure that takes a number as argument and displays the sum of all the digits in the number. For example, if the argument passed is 354, the procedure should display 12 (i.e. 3+5+4). 4

### Section - C

Q6. Read the questions given below and answer accordingly:

- a) Write the output produced by the following PL/SQL code:

2

```
DECLARE
    A NUMBER;
    B NUMBER;
    TEMP NUMBER;
BEGIN
    FOR X IN 1.. 4 LOOP
        TEMP:= A;
        A := B
        B := TEMP;
        A := A + 1;
        B := B - 1;
        DBMS_OUTPUT. PUT_LINE ('A = ' | | A);
        DBMS_OUTPUT. PUT_LINE ('B = ' | | B);
    END LOOP;
END;
```

- b) Find the errors from the following PL/SQL code and rewrite the corrected code underlining the correction made

2

```
DECLARATION
    V_MNO MOVIES.MOVIENO%TYPE;
    V_TITLE MOVIES.TITLE%TYPE;
    V_PRICE MOVIES.PRICE%TYPE;
BEGIN
    V_MNO EQUALS 101
    LOOP
```

```

SELECT TITLE, PRICE, RATING INTO V_TITLE, V_PRICE,
V_RATE FROM MOVIES

WHERE MOVIEENO = V_MNO;

DBMS_OUTPUT.PUTTEXT (V_TITLE || ' ' || V_PRICE);

EXIT WHEN V_RATE < 4;

V_MNO : = V_MNO + 1;

LOOP END;

END;

```

- c) Differentiate between the IN and IN OUT modes of a parameter in a PL/SQL block. 2
- d) Write a PL/SQL Function POWER that takes two numbers as arguments and returns the value of the first number raised to the power of the second. 4

Q7. Answer the questions based on the table CompLab given below:

**Table: CompLab**

Column Name	Data Type	Size	Constraint	Description
It_Code	NUMBER	4	PRIMARYKEY	Item Code Item category as
It_Cat	CHAR	1	'H' or 'S'	Hardware or Software
It_Name	VARCHAR2	25	NOT NULL	Name of the item
It_Cost	NUMBER	8.2		Cost of each unit of an item
It_Qty	NUMBER	3		Item Quantity In the Lab
Dt_Pur	Date			Date of Purchases

- (a) Write the SQL command to create the table CompLab including the constraints. 2
- (b) Write the SQL command to display the details of the item with the maximum It\_Cost. 2

- (c) Write the PL/SQL code to increase the item cost by 10% for an item code accepted from the user if the date of purchase of the item is later than 12-Oct-2005. 3
- (d) Write the PL/SQL code to create a stored procedure Disp\_Details to display the details of all the items with It\_Cat as 'H'. The code should also display the total quantity of all such Items. 4

## MARKING SCHEME — INFORMATICS PRACTICES

### Important Note:

- All answers provided in the marking scheme are SUGGESTIVE.
- Examiners are requested to accept all possible alternative correct answers.
- Case sensitivity to be ignored in Visual Basic for commands and identifiers.
- Semicolon termination and case sensitivity to be ignored in SQL statements.
- In case of answers for a SQL query, commands that produce identical output should be considered as correct.

### QUESTION PAPER CODE 90/1

### EXPECTED ANSWERS

#### Section - A

Q1. Answer the following questions

(a) Name any four application areas of business computing. 2

- Ans. 1. Inventory Control  
2. Financial Accounting  
3. Pay-Accounting System  
4. Invoice Management System  
5. Personal Management System / HRD System  
6. Fee Management System  
7. Result Analysis System  
8. Admission Management System  
9. Income Tax Management System

*(½ Mark each for mentioning any 4 correct application areas)*

(b) What are the following software used for? 2

- (i) Python  
(ii) Linux

Ans. (i) Python is used in application domains such as :

- Web and internet development (writing CGI scripts)

- Database Access
- Scientific and numeric computing
- Also provides support for network/game programming

(ii) Linux is an open source operating system used as a server or desktop (PC).

*(1 Mark for mentioning anyone correct point for Python)*

*(1 Mark for mentioning usage of Linux or specifying it as an Operating System)*

(c) Expand the terms OSI and GNU. 2

Ans. OSI - Open Source Initiative / Open System Interconnection

**GNU-Not Unix or GNU Not Unix**

*(1 Mark for each expansion)*

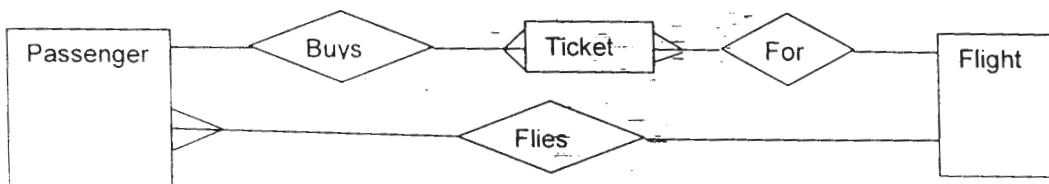
(d) Mention any two types of relationships that can be set up between two relations. Explain the concept of ER Model using the case study of a Air Ticketing System that has three entities Ticket, Passenger and Flight. Assume that each passenger can buy more than one ticket. 4

Ans: i) Many to Many relationships

ii) Many to One relationship

iii) One to One relationship

iv) One to Many



*(1 mark each for any 2 types of relationships)*

*(2 marks for showing any two of three relationships with equivalent representation as there are many ways to represent the concept of one-to-one, one-to-many)*

**NOTE:** Relationship between entities can be represented by any name. Each relationship may be shown independently also.

Q2. Answer the following questions

- (a) Differentiate between the Do While.....Loop and Do.....Loop While loops of Visual Basic giving a suitable example of each. 2

DO While.....Loop	DO.....Loop While
<p>1. Entry Controlled loop in which condition is checked before the entry into the loop</p> <p>2. Minimum number of times loop execute is zero.</p> <p>Example :</p> <pre>X=10 DO WHILE x&gt;1 PRINT X X=X-1 LOOP</pre>	<p>1. Exit controlled loop in which condition is checked at the end.</p> <p>2. Minimum number of times loop executes is once.</p> <p>Example :</p> <pre>X=10 DO PRINT X X=X-1 LOOP WHILE x&gt;1</pre>

*(1 Mark for anyone correct difference)*

*(1 Mark for anyone correct example)*

*OR*

*(2 Marks for example with explanation)*

- (b) Name and explain the usage of any two types of procedures available in Visual Basic. 2

- Ans: i) Function Procedures  
 ii) Sub Procedures  
 iii) Property Procedures  
 iv) Event Procedures

Usage: These are sub-programs or modules containing instructions, which can be called and executed from any other part of the program/project.

*(1/2 Mark each for mentioning any two correct procedure names)*

*(1/2 Mark each for their valid usage)*

- (c) What are data-bound controls? Name any two intrinsic data-bound controls that can be used on a form. 2

Ans: A data bound control connects a control in Visual Basic to a database table.

Intrinsic data-bound controls used on a form are:-

- i) Checkbox
- ii) Combobox
- iii) Image control
- iv) Label
- v) Listbox
- vi) PictureBox
- vii) Textbox

*(1 Mark for explanation)*

*(1/2 Mark each for any 2 intrinsic/standard controls)*

- (d) Explain the term ADO. Name and explain three different methods used to navigate through ADO recordsets.

4

Ans. ADO stands for ActiveX Data Objects. ADO enables us to write an application to access and manipulate data in a database server through an OLEDB/ADODC/ODBC provider.

**Methods:**

Movenext

Movefirst

MovePrevious

Movelast

Move

*(1 Mark for Explaining ADO)*

*(1/2 Mark each for naming any three of the above mentioned methods)*

*(1/2 Mark each for explaining any three of the above mentioned methods)*

Q3. Answer the following questions

- (a) Differentiate between TCL and DCL commands. Name one TCL and one DCL command.

2



Ans:	<b>TCL</b>	<b>DCL</b>
	<p>Transaction Control (TCL) statements are used to manage the changes made to the table by DML statements. It allows statements to be grouped together into logical transactions.</p> <ul style="list-style-type: none"> <li>● COMMIT</li> <li>● SAVE POINT</li> <li>● ROLLBACK (ROLLBACK TO)</li> </ul>	<p>Data Control Language is used for controlling access to data. That is a user can access any data based on the privileges given to him/her.</p> <p>Some examples:</p> <ul style="list-style-type: none"> <li>● GRANT</li> <li>● REVOKE</li> </ul>

*(1 Mark for difference)*

*(½ Mark for giving one example of each)*

- (b) Name the keyword used to: 2
- (i) Allow duplicate rows in a query.
  - (ii) Avoid duplicate rows in a query.

- Ans: (i) ALL (By default)/SELECT\*  
(ii) DISTINCT

*(1 Mark for each keyword)*

- (c) Mention any two limitations of SQL. 2

- Ans: 1. Procedural programming not supported in standard SQL  
2. No Exception handling capabilities  
3. Does not support Object Oriented Programming  
4. Does not Support Report writing

*(1 Mark each for mentioning any 2 limitations)*

- (d) Define the terms Primary key and Alternate key with respect to a database. 2

Ans: Primary Key is any attribute(s) which uniquely identify a row/tuple in a relation/table. Alternate key is any other attribute(s) which can serve as a Primary Key but has not been chosen as a primary key.

*(1 Mark for each correct definition)*

(e) Differentiate between Before and After type triggers.

2

Ans: 'Before Trigger' is executed/fired/activated/invoked before any DML statement.

'After Trigger' is executed/fired/activated/invoked after any DML statement.

(2 Marks for correct difference OR examples explaining the difference)

### SECTION - B

Q4. Read the following case, study and answer the questions that follow:

Xtra Care Hospital has computerized its billing. A new bill is generated for each patient. The hospital allows four different types of patients to take admission. The daily charges are based on the type of patient. The following is the data entry screen used to generate the bill at the time of discharging the patient :

The screenshot shows a window titled "Patient Bill Form" for "Xtra Care Hospital". It contains the following elements:

- Patient Name:** A text input field.
- Patient Type:** A group box containing four radio buttons: "OPD", "ICU", "Private", and "Dormitory".
- Admission Date:** A date input field.
- No. of Days:** A numeric input field.
- Discharge Date:** A date input field.
- Daily Charges:** A numeric input field.
- Bill Amount:** A numeric input field.
- Buttons:** "Clear All", "Calculate", and "Exit" buttons at the bottom.

Object type	Object Name	Description
Form	FrmBili	The main form
Text Box	TxtPname	To enter patient name
	TxtAdDate	To enter admission date
	TxtDiDate	To display discharge date as the system date

	TxtDays	To display number of days spent in hospital
	TxtCharge	To enter the daily charges
	TxtAmt	To display the final bill amount
Option Buttons	OptOPD	To select patient type of OPD
	OptICU	To Select patient type as ICU
	OptPrivate	To select patient type as Private
	OptDorm	To select patient type as Dormitory
Command Button	CmdClear	To clear all textboxes
	CmdCalc	To calculate bill amount
	CmdExit	To Exit from the application

- (a) Write the code for the CmdClear command button to clear all the textboxes except the txtDiDate textbox.

1

Ans:

Txtpname.Text = " "	OR	TxtPname.Text = VbEmpty
TxtAdDate.Text = " "		TxtAdDate.Text = VbEmpty
TxtDays.Text = " "		TxtDays.Text = VbEmpty
TxtCharge.Text = " "		TxtCharge.Text = VbEmpty
TxtAmt.Text = " "		TxtAmt.Text = VbEmpty

(1 Mark for clearing any 2 textboxes)

Note: .Text is optional

- (b) Write the code for the form load event of FrmBill so as to:

2

- (i) Display the system date in the TxtDiDate textbox.
- (ii) Disable the TxtDiDate and the TxtDays textboxes.

Ans: (i) `TxtDiDate.text = Date` OR `TxtDiDate.text =Date()`

OR <code>TxtDiDate.text = NOW</code> OR <code>TxtDiDate.text =NOW()</code>
---

(ii) `TxtDiDate.ENABLED = FALSE`  
`TxtDays.ENABLED = FALSE`

(1 Mark for each correct answer)

- (c) Write the code for the change event of the TxtAdDate textbox to display the number of days the patient has spent in the hospital. The number of days should be calculated as discharge date - admission date. The code should also display a warning message the admission date is input as a date later than the discharge date.

3

Ans: DIM DAYS AS INTEGER

```
LOGIC TO CALCULATE NUMBER OF DAYS
```

```
IF DAYS < 0 THEN
```

```
MSGBOX " ADMISSION DATE CANNOT BE LATER THAN DISCHARGE DATE"
```

```
OR
```

```
PRINT" ADMISSION DATE CANNOT BE LATER THAN-DISCHARGE DATE"
```

```
END IF
```

*(1 Mark for attempting to calculate the number of days)*

*(1 Mark for checking the condition)*

*(1 Mark for displaying the warning message)*

- (d) Write the code for the CmdCalc command button to display the final bill amount in the TxtAmt textbox. Note that Final bill amount is calculated as:

4

(No. of Days\* Daily Charge)

The Daily Charges are calculated according to the following criteria:

Patient Type	Daily Charge
OPD	300
ICU	4000
Private	2000
Dormitory	1000

Ans. DIM days As INTEGER

```
DIM charges As INTEGER
```

```
days = Val (TxtDays.Text)
```

```
IF OptOPD.Value = True THEN
```

```
    charges = 300
```

```
ELSEIF OptICU.Value = True THEN
```

```
    charges = 4000
```

```

ELSEIF OptPrivate.Value = True THEN
    charges = 2000
ELSE IF OptDorm.Value = True THEN
    charges = 1000
END IF
TxtCharge.Text = charges
TxtAmt.Text = charges*days

```

*(1 Mark for converting TxtDays into numeric)*

*(1 ½ Marks for computing charges)*

*(½ Mark for storing charges in TxtCharge textbox)*

*(1 Mark for calculating & storing amount in TxtAmt textbox)*

*NOTE: Any other equivalent logic must be accepted*

Q5. Answer the following questions

- (a) Find the errors from the following code segment and rewrite the corrected code underlining the correction made.

2

```

Sub Fibo (S1 As Integer, S2 As Integer, N As Integer)
Dimension count As Integer; term As Integer
Print S1
Print S2
For count = 3 Till N
    term = S1 + S2
    Print term
    S1 = S2
    S2 = term
Next Value
End Sub

```

Ans: Sub Fibo (S1 As Integer, S2 As Integer, N As Integer)

```

Dim count As Integer, term As Integer
Print S1
Print S2

```

```

For count = 3 TO N
    term = S1 + S2
    Print term
    S1 = 52
    S2 = term
Next count

```

OR Next

End Sub

*(1/2 Mark for identifying and correcting each error)*

*(1 Mark for Only identifying all errors)*

- (b) Rewrite the following code using Select Case construct without affecting the output:

2

```

Dim a As Integer
a = 4
If a = 1 Then
    Print "Sunday"
Elseif a >= 2 and a <= 6 Then
    Print "WeekDay"
Elseif a = 7 Then
    Print "Nearing Weekend"
End If

```

Ans. Dim a as Integer

```

a = 4
SELECT CASE a
    CASE 1
        Print "Sunday"
    CASE 2 TO 6 OR CASE IS > =2 AND IS <=6
        Print "WeekDay"

```

CASE 7

Print "Nearing Weekend"

END SELECT

( 1/2 Mark for each case)

( 1/2 Mark for select case)

(c) Find the output of the following code:

2

```
Dim a as String
```

```
Dim I as Integer
```

```
a = "KANK"
```

```
I = Len (a)
```

```
Do
```

```
Print Mid (a, I)
```

```
I = I - 1
```

```
Loop While I > 0
```

Ans: K

NK

ANK

KANK

(1/2 Mark for each correct line of output)

(d) Write a Visual basic function that takes two String arguments and compares the two strings. The function return 0 if both the arguments are equal. The function returns - 1 if the first argument is smaller than the second and 1 if the second argument is smaller then first.

4

Ans: Public Function strcmp (Str1 As String, Str2 As String) As Integer

OR Private Function strcmp (Byval Str1 As String, Byval Str2 As String) As Integer
--

```
If Str1 < Str2 Then
```

```
strcmp = -1
```

```
ElseIf Str1 = Str2 Then
```

```

        strcmp = 0
Else
        strcmp = 1
End If
End Function

```

*(½ Mark for function header (Name and arguments))*

*(½ Mark for return type of the function)*

*(1 Mark for each condition)*

*NOTE: Any other equivalent logic must be accepted*

### **SECTION - C**

Q6. Read the questions given below and answer accordingly:

a) Write the output produced by the following PL/SQL code:

2

```

DECLARE
    A NUMBER;
    B NUMBER;
    TEMP NUMBER;
BEGIN
    FOR X IN 1..4 LOOP
        TEMP := A;
        A := B;
        B := TEMP;
        A := A + 1;
        B := B-1;
        DBMS_OUTPUT . PUT_LINE ( 'A = ' | | A );
        DBMS_OUTPUT . PUT_LINE ( 'B = ' | | B );
    END LOOP;
END;

```

*(2 Marks for attempting or identifying that variables have not been initialized)*

*(2 Marks to be awarded if either Q6.(b) or (c) or (d) ;s answered correctly)*



- (b) Find the errors from the following PL/SQL code and rewrite the corrected code underlining the correction made

2

```
DECLARATION

    V_MNO MOVIES.MOVIENO%TYPE;
    V_TITLE MOVIES.TITLE%TYPE;
    V_PRICE MOVIES.PRICE%TYPE;

BEGIN

    V_MNO EQUALS 101

    LOOP

        SELECT TITLE, PRICE, RATING INTO V_TITLE,
            V_PRICE, V_RATE FROM MOVIES

            WHERE MOVIENO = V_MNO;

            DBMS_OUTPUT.PUTTEXT(V_TITLE || ' ' || V_PRICE);

            EXIT WHEN V_RATE < 4;

            V_MNO: = V_MNO + 1;

        LOOP END;

    END;
```

Ans: DECLARE

```
    V_MNO MOVIES. MOVIENO%TYPE;
    V_TITLE MOVIES.TITLE%TYPE;
    V_PRICE MOVIES.PRICE%TYPE;
    V_RATE MOVIES.RATING%TYPE;

BEGIN

    V_MNO := 101;    OR DEFAULT CAN BE USED I

    LOOP

        SELECT TITLE, PRICE, RATING INTO V_TITLE,
            V_PRICE, V_RATE FROM MOVIES

            WHERE MOVIENO = V_MNO;
```

```

        DBMS_OUTPUT. PUT_LINE (V_TITLE || ' ' || V_PRICE);
        EXIT WHEN V_RATE < 4;
        V_MNO := V_MNO + 1;
    END LOOP;

```

END;

*(½ Mark each for identifying and correcting any 4 errors)*

*(1 Mark for ONLY identifying any 4 errors)*

- (c) Differentiate between the OUT and IN OUT modes of a parameter in a PL/SQL block. 2

- Ans: 1. OUT mode is used to send formal argument value to the actual argument in the calling environment/block.
2. IN OUT mode is used to receive and send formal argument value to the actual argument in the calling environment/block.

*(2 Marks for correct difference)*

OR

*(2 Marks for correct explanation of difference with the help of example)*

- d) Write a PL/SQL Function CheckDiv that takes two numbers as arguments and returns that value 1 if the first argument passed to it is divisible by the second argument else it should return the value 0. 4

Ans: CREATE OR REPLACE FUNCTION CheckDiv (Num1 NUMBER,  
Num2 NUMBER) RETURN NUMBER

AS/IS

```

    BEGIN
        IF MOD (Num1, Num2)=0 THEN
            RETURN 1;
        ELSE
            RETURN 0;
        END IF;
    
```

END;

OR

Any other equivalent code

(1 Mark for Function header)

(1 Mark for IF)

(1 Mark for MOD)

(1 Mark for Returning value)

Q7. Answer the questions based on the table Apartment given below:

**Table: Apartment**

Column Name	Data Type	Size	Constraint	Description
A_No	NUMBER	4	PRIMARY KEY	Apartment number
A_Cat	CHAR	1	'D' or 'S'	Apartment category as Delux or SuperDelux
Pur_Name	VARCHAR2	30		Name of the purchaser
A_Cost	NUMBER	8.2		Cost of apartment
Dt_Sold	DATE			Date of Selling

(a) Write the SQL command to create table Apartment including the constraints.

2

Ans: REATE TABLE APARTMENT

```
{  
A_No NUMBER (2) PRIMARY KEY, OR NOT NULL UNIQUE ,  
A_cat CHAR CHECK(A_Cat='D' OR A_Cat= 'S'),  
OR CHECK(A Cat IN('D' .'S'))  
Pur_Name VARCHAR2 (30) ,  
A_Cost NUMBER (8, 2),  
Dt_Sold DATE  
};
```

(1/2 Mark for CREATE TABLE)

(1/2 Mark for fields with data types)

(1/2 Mark for PRIMARY KEY constraint)

(1/2 Mark for CHECK constraint)

- (b) Write the SQL command to display the category and number of apartments in each category. 2

Ans. 

```
SELECT A_Cat, COUNT (*) OR COUNT (A_CAT)
FROM Apartment
GROUP BY A_Cat ;
```

*(1 Mark for grouping)*

*(1 Mark for projection)*

- (c) Write the PL/SQL code to increase the apartment cost by 5% for an apartment number accepted as parameter and display the update details. 3

Ans. 

```
CREATE OR REPLACE PROCEDURE INC_COST(Apno IN NUMBER)
IS/AS
```

```
Cost Apartment.A_Cost%TYPE;
```

```
BEGIN
```

```
UPDATE Apartment
```

```
SET A_Cost = A_Cost + 0.05*A_Cost
```

```
where A_No = Apno;
```

```
Select A_Cost INTO Cost from Apartment
```

```
Where A_No = Apno;
```

```
DBMS_OUTPUT.PUT_LINE( Apno || ' ' || Cost);
```

```
END;
```

*( 1 Mark for Header)*

*(1 Mark for Update)*

*(1 Mark for Display)*

*Any other equivalent code must be accepted*

- (d) Write the PL/SQL code to create a stored procedure NOTSQLD to display the details of all the apartments which have not been sold. The code should also display the total cost of all such apartment. 4

Ans. 

```
CREATE OR REPLACE PROCEDURE NOTSQLD()
IS/AS
```

```

CURSOR C1 IS
    SELECT * FROM Apartment
    WHERE Dt_Sold IS NULL; OR WHERE Pur Name IS NULL
REC C1%ROWTYPE;
Tcost Number (10,2) := 0;
BEGIN
    OPEN C1;
    LOOP
        FETCH C1 INTO Rec.
        EXIT WHEN C1%NOTFOUND;
        Tcost :=Tcost+ Ree.A_Cost;
        DBMS_OUTPUT.PUT_LINE (Rec.A_No || ' ' || Rec.A_Cat
                                || ' ' || Rec.A_Cost);
    END LOOP;
    CLOSE C1;
    DBMS_OUTPUT. PUT_LINE (Tcost);
END;

```

*(1/2 Mark for procedur header)*

*(1 Mark for Cursor Declaration)*

*(2 Marks for Cursor Processing Loop)*

*(1/2 Mark for displaying total cost)*

*NOTE: Any other form of Loop for processing cursor must be accepted*

## QUESTION PAPER CODE 90

### EXPECTED ANSWERS

#### Section - A

Q1. Answer the following questions

(a) Expand the terms OSS and W3C.

2

Ans: Open Source Software  
World Wide Web Consortium

*(1 Mark for each expansion)*

(b) What are the following software used for?

2

- (i) PHP
- (ii) MySQL

Ans: i) Hypertext Preprocessor is open source software used for server side scripting applications.

ii) MySQL is multiuser, multithreaded open source RDBMS

*(1 Mark for each correct usage)*

*(½ Mark only for expanding the acronym PHP)*

(c) Name any four application areas of databases.

Ans: Application areas:

1. Inventory Control
2. Financial Accounting
3. Pay-Accounting System
4. Invoice Management System
5. Personal Management System/HRD System
6. Fee Management system
7. Result Analysis System
8. Admission Management System
9. Income Tax Management System

*(½ Mark each for mentioning any 4 correct application areas)*

(d) What are the different types of relationships that can be depicted through an ER model? Explain the concept of ER Model using the case study of a Ticket Reservation System that has three entities Ticket, Passenger and Train. Assume that each passenger can buy more than one ticket.

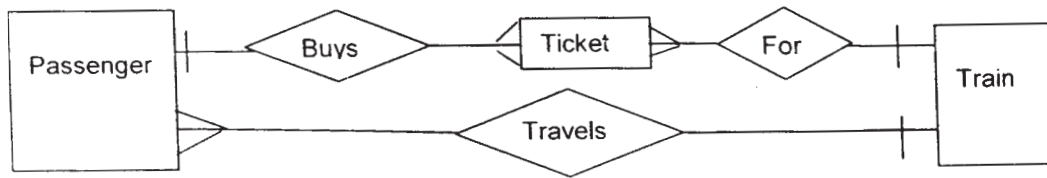
4

Ans: i) Many to Many relationship

ii) Many to One relationship

iii) One to One relationship

iv) One to Man



(1 Mark each for any 2 types of relationships)

(2 Marks for showing any two of three relationships)

NOTE: Relationship between entities can be represented by any name

Q2. Answer the following questions

- (a) Differentiate between the FOR ... NEXT and FOR EACH ... NEXT loop of Visual Basic giving a suitable example of each.

Ans: FOR.. NEXT is executed for a given number of times.

Example

```
FOR i=1 to 5
```

```
PRINT i
```

```
NEXT i
```

FOR EACH.. NEXT LOOP is executed for each element of a collection.

```
DIM i AS Variant
```

```
FOR EACH i IN Form1.Controls
```

OR Any collection can be used for example

```
MsgBox i.Name
```

```
NEXT
```

(1 Mark for any correct difference)

(1 Mark for any correct example)

OR

(2 Marks for any-correct example with explanation)

- (b) Name and explain the usage of any two types of modules available in Visual Basic.

Ans: Form Module - contains code pertaining to form objects.

Standard Module - contains code pertaining to a project.

Class Module - contains code for user declared objects.

(1/2 Mark each for mentioning any two modules)

(1/2 Mark each for explaining their usage)

- (c) What are data-aware controls? Name any two ActiveX data aware controls that can be used on a form 2

Ans: A data aware control connects a control in Visual Basic to a database table.

ActiveX data-aware controls used on a form are:

- i) DataList
- ii) DataGrid
- iii) DataCombo
- iv) MSFlexgrid

(1 Mark for explanation)

(½ Mark each for any 2 ActiveX controls)

- (d) Explain the term ADO object model. Differentiate between the Connection Timeout and Command Timeout properties of the Connection object. 2

Ans: ADO stands for ActiveX Data Objects. ADO enables us to write an application to access and manipulate data in a database server through an OLEDB/ADODC/ODBC provider. Connection timeout is the time specified after which the connection process is aborted. Command Timeout is the time specified after which the command execution is aborted.

*(4 Marks for any answer bringing out the meaning of the ADO concept)*

Q3. Answer the following questions

- (a) Differentiate between row-level and statement-level triggers. 2

Ans: Row level Triggers are fired I executed once for each row in a table. FOR EACH ROW clause is included in the Trigger Definition.

Statement level Triggers are fired I executed once for a DML Statement. FOR EACH ROW clause is not included in the Trigger Definition.

*(2 Marks for difference)*

OR

*(2 Marks for giving one example of each)*

- (b) Define the terms Candidate key and Foreign key with respect to a database. 2

Ans: Candidate key is any attribute(s) which can serve as a Primary Key.



Foreign Key is any non key attribute which references a primary key of some other table.

*(1 Mark for each correct definition)*

- (c) Differentiate between DDL and DML commands. Give one example of each type of command

DDL	DML
Data Definition language commands create, alter or delete the structure of a table. Example CRE.ATE. ALTER DROP	Data manipulation language commands manipulate and process data in a table. Example INSERT UPDATE, DELETE

*(1 Mark for difference)*

*(1/2 Mark for giving one example of each)*

- (d) Mention any two advantages of PL/SQL as compared to SQL

2

- Ans: 1. Support for Procedural programming.  
2. Support for Exception handling capabilities.  
3. Support for report writing.

*(1 Mark each for mentioning any 2 advantages)*

- (e) Name the keyword used to

2

- (i) Allow duplicate rows in a query.  
(ii) Avoid duplicate rows in a query.

- Ans: (i) ALL (By default) / SELECT\*

- (ii) DISTINCT

*(1 Mark for each keyword)*

### SECTION - B

4. Read the following case study and answer the questions that follow:

Mr. Presi of Super Store decided to computerize the billing department. The accounts manager at Super Store is creating billing software to generate the bill during the sale period. A new bill is generated for each item sold. The discount is given based on the

item category. An additional discount of 5% is given to the Store Membership Card holders. The following is the data entry screen used at the store:

The list of controls for the above form is as follows:

Object Type	Object Name	Description
Form	FrmBili	The main form
Text Box	TxtBillno	To enter Bill Number
	TxtBillDate	To display System Date
	TxtlName	To input Item Name
	TxtPrice	To input Item Price
	TxtDisc	To display Discount
	TxtFinal	To display Final Price
Option Buttons	Optmens	To select Men's Category
	OptWomens	To Select Women's Category
	OptKids	To select Kid's Category
Command Button	ChkMember	To be checked for members
	CmdCalc	To calculate discount and Final Price
	CmdClear	To clear all textboxes
	CmdExit	To Exit from the application

- (a) Write the code for the CmdClear command button to clear all the textboxes except the TxtBillDate textbox

1

Ans: TxtBillno.Text=" "

TxtIname.Text=" "

Text is optional

TxtPrice.Text=" "

TxtDisc.Text=" "

instead of " " vbEmpty can be accepted

TxtFinal.Text=" "

*(1 Mark for clearing any 2 textboxes)*

- (b) Write the code for the form load event of FrmBill so as to:

2

(i) Display the system date in the TxtBillDate textbox.

(ii) Disable the TxtBill Date, TxtDisc and TxtFinal textboxes

Ans. (i) TxtBillDate.text = Date OR TxtBillDate.text =Date()

OR

TxtBillDate.text = NOW OR TxtBillDate.text=NOW()

(ii)TxtBillDate.ENABLED = FALSE

TxtDise.ENABLED = FALSE

TxtFinal.ENABLED = FALSE

*(1 Mark for displaying system date)*

*(1 Mark for disabling any 2 text boxes)*

- (c) Write the code for the change event of the TxtPrice textbox to ensure that the user does not enter a negative or a zero value. If a negative or a zero value is entered then the textbox should be made blank and a warning message should be displayed.

3

Ans: V=Val(TxtPrice.text)

IF v <=0 then

Msgbox" Re-enter a positive value greater Than 0"

TxtPrice.text=" "

END IF

(1 Mark for conversion of txtPrice to numeric)

(1 Mark for checking the condition)

(½ Mark for displaying the warning message)

(½ Mark for clearing txtPrice)

*NOTE: If code is written under lost Focus or Validate event procedure full marks must be awarded.*

- (d) Write the code for the CmdCalc command button to display the discount and final price in the TxtDisc, and TxtFinal textboxes respectively. Note that Final price is calculated as price - discount and the discount is calculated based on the category and price according to the following table. Also remember to give an additional 5% discount for membership card holders i.e. if the ChkMember check box is checked.

4

Category	Price	Discount
Men's	<1000	30%
	>=1000	50%
Women's	<1500	40%
	>=1500	50%
Kid's	<500	20%
	>=500	30%

Ans. Price=Val (TxtPrice. text)

```
IF OptMens.value=True THEN
    IF price<1000 THEN disc=0.3
        ELSE disc=0.5
    END IF
ELSEIF OptWomens.Value=True THEN
    IF price<1500 THEN disc=0.4
        ELSE disc=0.5
    END IF
```

```

ELSEIF OptKids.Value =True THEN
    IF price<500 THEN disc=0.2
    ELSE disc=0.3
    END IF
END IF
IF ChkMember.Value=1 THEN
    Disc=disc+0.05
END IF
END IF
TxtDisc.text=disc
TxtFinal.text=price-price*disc

```

*(1 Mark for converting TxtPrice into numeric)*

*(1½ Marks for computing discount)*

*(½ Mark for storing discount in TxtDisc textbox)*

*(1 Mark for storing amount in TxtFinal textbox)*

*NOTE: Any other equivalent logic must be accepted*

Q5. Answer the following questions

- (a) Find the errors from the following code segment and rewrite the corrected code underlining the correction made.

2

```

PRIVATE FUNCTION IsPrime (num As Integer) As Bool
DIM limit As Integer
limit = num / 2
FOR ctr = 2 TO limit
    IF num Modulo ctr = 0 THEN
        EXIT FOR LOOP
    END IF
NEXT
IsPrime = IIf(ctr > limit, True, False)
End Sub

```

```

Ans: PRIVATE FUNCTION IsPrime (num As Integer) As Boolean

    DIM limit As Integer

    limit = num / 2

    FOR ctr = 2 TO limit

        IF num Modulo ctr = 0 THEN

            EXIT FOR

        END IF

    NEXT

    IsPrime = IIf(ctr > limit, True, False)

End FUNCTION

```

*(1/2 Mark for identifying and correcting each error)*

*(1 Mark for ONLY identifying all errors)*

*NOTE: If ctr is identified as undeclared variable, it can be counted as an error.*

(b) Find the output of the following code:

2

```

DIM astr as string

DIM I as Integer

I = 1

astr = "Come"

DO WHILE I <= Len (astr)

    Print Mid (astr, I)

    I = I + 1

LOOP

```

Ans: Come

ome

me

e

*(1/2 Mark for each correct line of output)*

- (c) Rewrite the following code using If Then Else construct without affecting the output:

2

```
DIM a As Integer
a = 1
SELECT Case a
    Case 1
        Print "Sunday"
    Case 2 To 6
        Print "WeekDay"
    Case 7
        Print "Nearing Weekend"
END SELECT
```

Ans: DIM a As Integer

```
a = 1
IF a = 1 THEN
    Print "Sunday"
ELSEIF a >= 2 and a <= 6 THEN
    Print "WeekDay"
ELSEIF a = 7 THEN
    Print "Nearing Weekend"
END IF
```

*(1/2 Mark each for checking a=1 and a=7)*

*(1 Mark for checking a >= 2 and a <= 6)*

- (d) Write a Visual Basic procedure that takes a number as argument and displays the sum of all the digits in the number. For example, if the argument passed is 354, the procedure should display 12 (i.e. 3+5+4).

4

Ans: PRIVATE SUB SumDigits (ByVal n As Integer)	PRIVATE SUB SumDigits (ByVal n As Integer)
--	---

<pre>OR Public Sub SumDigits (n As Integer)</pre>	<pre>OR Public Sub SumDigits (n As Integer)</pre>
<pre>DIM i, sum As Integer sum = 0 DO WHILE n &gt; 0     i = n Mod 10     sum = sum + i     n = n \ 10 LOOP MsgBox "sum=" &amp; sum END SUB</pre>	<pre>DIM i, sum As Integer sum = 0 For I=1 to LEN(Str(n)) sum=sum+Val(Mid(Str(n),I,1)) NEXT MsgBox "sum=" &amp; sum END SUB</pre>

*(1 Mark for initializing sum variable)*

*(1 Mark for loop).*

*(1 Mark for summation of digits)*

*(1 Mark for displaying sum)*

*NOTE: Any other equivalent logic must be accepted*

### Section - C

Q6. Read the questions given below and answer accordingly:

- a) Write the output produced by the following PL/SQL code:

2

```
DECLARE
    A NUMBER;
    B NUMBER;
    TEMP NUMBER;
BEGIN
    FOR X IN 1.. 4 LOOP
        TEMP:= A;
        A := B
        B := TEMP;
```



```

        A := A + 1;

        B := B - 1;

        DBMS_OUTPUT.PUT_LINE ('A = ' || A);

        DBMS_OUTPUT.PUT_LINE ('B = ' || B);

    END LOOP;

END;

```

*(2 Marks for attempting or identifying that variables have not been initialized)*

*OR*

*(2 Marks to be awarded if either Q6.(b) or (c) or (d) is answered correctly)*

- b) Find the errors from the following PL/SQL code and rewrite the corrected code underlining the correction made

2

```

DECLARATION

    V_MNO MOVIES.MOVIENO%TYPE;

    V_TITLE MOVIES.TITLE%TYPE;

    V_PRICE MOVIES.PRICE%TYPE;

BEGIN

    V_MNO EQUALS 101

    LOOP

        SELECT TITLE, PRICE, RATING INTO V_TITLE, V_PRICE,

        V_RATE FROM MOVIES

    WHERE MOVIENO = V_MNO;

    DBMS_OUTPUT.PUTTEXT (V_TITLE || ' ' || V_PRICE);

    EXIT WHEN V_RATE < 4;

    V_MNO : = V_MNO + 1;

    LOOP END;

END;

```

Ans: DECLARE

```

    V_MNO MOVIES. MOVIENO%TYPE;

```

```

V_TITLE MOVIES.TITLE%TYPE;
V_PRICE MOVIES.PRICE%TYPE;
V_RATE MOVIES.RATING%TYPE;

```

---

```

BEGIN
    V_MNO := 101;      OR DEFAULT CAN BE USED
    LOOP
        SELECT TITLE, PRICE, RATING INTO V_TITLE,
        V_PRICE, V_RATE FROM MOVIES
        WHERE MOVIEENO = V_MNO;
        DBMS_OUTPUT.PUT_LINE (V_TITLE || ' ' || V_PRICE);
        EXIT WHEN V_RATE < 4;
        V_MNO := V_MNO + 1;
    END LOOP;
END;

```

*(1/2 Mark for identifying and correcting each error)*

*(1 Mark for ONLY identifying all errors)*

- c) Differentiate between the IN and IN OUT modes of a parameter in a PL/SQL block. 2

Ans: 1. IN mode is used to receive actual argument value into the formal argument.

2. IN OUT mode is used to receive and send formal argument value to the actual argument in the calling environment/block.

*(2 Marks for correct difference)*

*OR*

*(2 Marks for correct explanation of difference with the help of example)*

- d) Write a PL/SQL Function POWER that takes two numbers as arguments and returns the value of the first number raised to the power of the second. 4

Ans: Create OR Replace FUNCTION Power(n IN Number, m IN number)

RETURN number as/is

```
BEGIN
```

```
Return n**m;
```

```
OR Power function can also be used
```

```
END;
```

*(2 Marks for Function header)*

*(1½ Marks for Logic to compute power)*

*(½ Mark for returning the power value)*

*Note: Since POWER is a predefined function in PUSQL, accept as correct a change in name of the function*

Q7. Answer the questions based on the table CompLab given below:

**Table: CompLab**

Column Name	Data Type	Size	Constraint	Description
It_Code	NUMBER	4	PRIMARYKEY	Item Code
It_Cat	CHAR	1	'H' or 'S'	Item category as Hardware or Software
It_Name	VARCHAR2	25	NOT NULL	Name of the item
It_Cost	NUMBER	8,2		Cost of each unit of an item
It_Qty	NUMBER	3		Item Quantity In the Lab
Dt_Pur	Date			Date of Purchases

(a) Write the SQL command to create the table CompLab including the constraints.

Ans: CREATE TABLE CompLab

(

```
It_Code NUMBER(2) PRIMARY KEY,
```

```
OR NOT NULL UNIQUE
```

```
It_Cat CHAR CHECK(It_Cat = 'H' OR It_Cat = 'S'),
```

```
OR CHECK (It_Cat IN ('H','S'))
```

```
It_Name VARCHAR2(30) NOT NULL,
```

```
It_Cost NUMBER(8, 2),
```

```

        It_Oty    NUMBER (3) ,
        Dt_pur    Date
    );

```

*(½ Mark for CREATE TABLE table name)*

*(½ Mark for fields with data types)*

*(½ Mark for PRIMARY KEY and NOT NULL constraint)*

*(½ Mark for CHECK constraint)*

- (b) Write the SQL command to display the details of the item with the maximum It\_Cost. 2

Ans: `SELECT * FROM CompLab`

```

WHERE It_Cost=(SELECT MAX(It_Cost) FROM CompLab) ;

```

*(1 Mark for outer query)*

*( 1 Mark for sub query)*

- (c) Write the PL/SQL code to increase the item cost by 10% for an item code accepted from the user if the date of purchase of the item is later than 12-Oct-2005. 3

Ans: `CREATE OR REPLACE PROCEDURE INC_COST (p_It_Code IN NUMBER)`

`IS/AS`

```

    V_Cost CompLab.It_Cost%TYPE;

```

`BEGIN`

```

    UPDATE CompLab

```

```

    SET It_Cost = IT_Cost + 0.1*IT_Cost

```

```

    WHERE It_Code = p_It_Code AND Dt_Pur>'12-0et-2005';

```

`END;`

*(1 Mark for Header) (1 Mark for Update)*

*(1 Mark for Where Clause)*

*Note : Value for Item code to be updated can be accepted within the procedural block Any other equivalent code must be accepted*

- (d) Write the PL/SQL code to create a stored procedure Disp\_Details to display the details of all the items with It\_Cat as 'H'. The code should also display the total quantity of all such Items.

4

```
Ans: CREATE OR REPLACE PROCEDURE Disp_Details
AS/IS
CURSOR C1 IS
    SELECT * FROM CompLab
    WHERE It_Cat = 'H';
Rec c1%ROWTYPE;
Tqty Number (5) :=0;
BEGIN
OPEN C1;
LOOP
    FETCH C1 INTO Rec;
    EXIT WHEN C1%NOTFOUND;
    Tqty :=Tqty+ Rec.It_Qty;
    DBMS_OUTPUT. PUT_LINE ( Rec.It Code || ' ' || Rec.
    It_Name || ' ' || Rec. It_Qty);
END LOOP;
CLOSE C1;
DBMS_OUTPUT. PUT_LINE (Tqty) ;
END;
```

*(1/2 Mark for procedure header)*

*(1 Mark for Cursor Declaration)*

*(2 Marks for Cursor Processing Loop)*

*(1/2 Mark for displaying total quantity)*

*NOTE: Any other form of Loop for processing cursor must be accepted*

# COMPUTER SCIENCE

*Time allowed : 3 hours*

*Maximum Marks : 70*

***Instructions:***

- (i) *All questions are compulsory.*
- (ii) *Programming Language: C++*

## QUESTION PAPER CODE 91/1

1. (a) What is the difference between automatic type conversion and type casting? Also, give a suitable C++ code to illustrate both. 2
- (b) Which C++ header file(s) will be essentially required to be included to run/execute the following C++ code? 1

```
void main( )  
{  
    int Eno=123, char Ename[ ]="Rehan Swamp";  
    cout<<setw(5)<<Eno<<setw(25)<<Ename<<endl;  
}
```

- (c) Rewrite the following c++ program code after removing the syntax error(s) (if any). Underline each correction. 2

```
include <iostream.h>  
  
class TRAIN  
{  
    long TrainNo;  
    char Description[25];  
  
public  
    void Entry ( )  
    {
```

```

        cin >>TrainNo; gets(Description);
    }
    Void Display ( )
    {
        cout<<TrainNo<<":"<<Description<<endl;
    }
};

void main( )
{
    TRAIN T;
    Entry. T( ); Display. T( );
}

```

(d) Find the output of the following program :

**3**

```

#include <iostream.h>

struct POINT
{int X, Y, Z};

void StepIn(POINT & P, int Step=1)
{
    P.X+=Step;
    P.Y -=Step;
    P.Z+=Step;
}

void StepOut(POINT & P, int Step=1)
{
    P.X-=Step;
    P.Y+=Step;
    P.Z-=Step;
}

```

```

}
void main ( )
{
    POINT P1={15, 25, 5}, P2={10, 30, 20};
    StepIn(P1);
    StepOut(P2,4);
    cout<<P1.X<<" , "<<P1.Y<<" , "<<P1.Z<<endl;
    cout<<P2.X<<" , "<<P2.Y<<" , "<<P2.Z<<endl;
    StepIn(P2,12);
    cout<<P2.X<<" , "<<P2.Y<<" , "<<P2.Z<<endl;
}

```

(e) Find the output of the following program :

2

```

#include <iostream.h>
#include <ctype.h>
void ChangeIt(char Text[ ], char C)
{
    for (int K=0;Text[K]!='\0';K++)
    {
        if (Text[K]>='F' && Text[K]<='L')
            Text[K]=tolower(Text[K]);
        else
            if (Text[K]=='E' || Text[K]=='e')
                Text[K]= C;
            else
                if (K%2==0)
                    Text[K]=toupper(Text[K]);
                else

```



```

        Text[K]=Text[K-1];
    }
}
void main ( )
{
    char OldText[ ]="pOwERALone";
    ChangeIt(OldText, '%');
    cout<<"New TEXT:"<<OldText<<endl;
}

```

- (f) The following code is from a game, which generates a set of 4 random numbers. Yallav is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.

2

```

#include <iostream.h>
#include <stdlib.h>
const int LOW=15;
void main ( )
{
    randomize( ) ;
    int POINT=5, Number;
    for (int I=1;I<=4;I++)
    {
        Number=LOW+random(POINT) ;
        cout<<Number<<" : " ;
        POINT--;
    }
}

```

- (i) 19:16:15:18:
- (ii) 14:18:15:16:
- (iii) 19:16:14:18:
- (iv) 19:16:15:16:

2. (a) What do you understand by Polymorphism.? Also, give an example in C++ to illustrate the same. 2

(b) Answer the questions (i) and (ii) after going through the following class: 2

```
class TEST
{
    int Regno, Max, Min, Score;
public:
    TEST() //Function 1
    {
        Regno= 101;Max=100;Min=40;Score=75;
    }
    TEST(int Pregno,int Pscore) //Function 2
    {
        Regno=Pregno;Max=100;Min=40;Score=Pscore;
    }
    ~TEST() //Function 3
    {
        cout<<"TEST Over"<<endl;
    }
    void Display() //Function 4
    {
        cout<<Regno<<":"<<Max<<":"<<Min<<endl;
        cout<<"[Score]"<<Score<<endl;
    }
};
```

- (i) As per Object Oriented Programming, which. concept is illustrated by **Function 1 and Function 2** together?
- (ii) What is **Function 3** specifically referred as ? When do you think, **Function 3** will be invoked/called?
- (c) Define a class ITEM in C++ with following description: 4

Private Members

- Code of type integer (Item Code)
- Iname of type string (Item Name)
- Price of type float (Price of each item)
- Qty of type integer (Quantity of item in stock)
- Offer of type float (Offer percentage on the item)
- A member function GetOffer() to calculate Offer percentage as per the following rule:

If Qty<=50                      Offer is 0

If 50<Qty<=100              Offer is 5

If Qty>100                    Offer is 10

Public Members

- A function GetStock() to allow user to enter values for Code, Iname, Price, Qty and call function GetOffer() to calculate the offer
- A function ShowItem() to allow user to view the content of all the data members

- (d) Answer the questions (i) to (iv) based on the following: 4

class Chairperson

```
{
    long CID;           //Chairperson Identification Number
    char CName[20];

protected:
    char Description [40];
    void Allocate();
```

```

public:
    Chairperson();
    void Assign();
    void Show();
};

class Director
{
    int DID;           //Director ID
    char Dname[20];

protected:
    char Profile[30];

public:
    Director();
    void Input();
    void output();
};

class Company: private Chairperson, public Director
{
    int CID;           //Company ID
    char City[20], Country[20];

public:
    Company();
    void Enter();
    void Display();
};

```

- (i) Which type of inheritance out of the following is specifically is illustrated in the above C++ code?

- (a) Single Level Inheritance
  - (b) Multi Level Inheritance
  - (c) Multiple Inheritance
- (ii) Write the names of data members, which are accessible by objects of class type Company.
  - (iii) Write the names of all member functions, which are accessible by objects of class type Company.
  - (iv) Write the names of all members, which are accessible from member functions of class Director.
3. (a) Write a function CHANGE0 in C++, which accepts an array of integer and its size as parameters and divide all those array elements by 7 which are divisible by 7 and multiply other-array elements by 3.

3

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
21	12	35	42	18

Content of the array after Calling CHANGE() function

A[0]	A[1]	A[2]	A[3]	A[4]
3	36	5	6	54

- (b) An array P[50][60] is stored in the memory along the column with each of the element occupying 2 bytes, find out the memory location for the element P[10][20], if the Base Address of the array is 6800.
- (c) Write a complete program in c++ to implement a dynamically allocated Stack containing names of Countries.
- (d) Write a function int SKIPSUM(int A[ ][3], int N,int M) in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from A[0][0].

3

4

2

Hint:

If the following is the content of the array

A[0][0]	A[0][1]	A[0][2]
4	5	1
A[1][0]	A[1][1]	A[1][2]
2	8	7
A[2][0]	A[2][1]	A[2][2]
9	6	3

The function SKIPSUM() should add elements A[0][0], A[0][2], A[1][1], A[2][0] and A[2][2].

- (e) Evaluate the following postfix notation of expression: 2  
 (Show status of Stack after each operation)  
 False, True, NOT, OR, True, False, AND, OR
4. (a) Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using tellg() and seekp() functions for performing the required task. 1

```
#include <fstream.h>

class Client
{
    long Cno; char Name[20], Email[30] ;
public:
    //Function to allow user to enter the Cno, Name,
    Email
    void Enter() ;

    //Function to allow user to enter (modify) Email
    void Modify() ;

    long ReturnCno() {return Cno;}
};

void ChangeEmail()
```

```
{ Client C;
    fstream F;
```

```

F.open ("INFO.DAT",ios::binary|ios::in|ios::out);
long Cnoc;//Client's no. whose Email needs to be
changed
cin>>Cnoc;
while (F.read((char*)&C, sizeof(C)))
{
    if (Cnoc= =C.ReturnCno())
    {
        C.Modify();
                                //Statement 1
        int Pos = _____//To find the current
                                position of file pointer
                                // Statement 2
        _____//To move the file
                                pointer to write the
                                //modified record
                                back onto the file
                                //for the desired Cnoc
        F.write((char*)&C, sizeof(C));
    }
}
F.close();
}

```

- (b) Write a function in C++ to count the words “this” and “these” present in a text file “ARTICLE.TXT”.

2

[Note that the words “this” and “these” are complete words]

- (c) Write a function in C++ to search and display details of all flights, whose destination is “Mumbai” from a binary file “FLIGHT.DAT”. Assuming the binary file is containing the objects of the following class.

3

```

class FLIGHT
{
    int Fno;           //Flight Number
    char From[20];    //Flight Starting Point
    char To[20];      //Flight Destination

public:
    char* GetFrom() {return From;}
    char* GetTo() {return To;}
    void Enter() {cin>>Fno;gets(From);gets(To);}
    void Display(){cout<<Fno<<": "<<From<<": "<<To<<endl;}
};

```

5. (a) What do you understand by Candidate Keys in a table? Give a suitable example of Candidate Keys from a table containing some meaningful data.
- (b) Consider the following tables STORE and SUPPLIERS and answer (b1) and (b2) parts of this question:

2

Table: STORE

ItemNo	Item	Scode	Qty	Rate	LastBuy
2005	Sharpener Classic	23	60	8	31-Jun-09
2003	Ball Pen 0.25	22	50	25	01-Feb-10
2002	Gel Pen Premium	21	150	12	24-Feb-10
2006	Gel Pen Classic	21	250	20	11-Mar-09
2001	Eraser Small	22	220	6	19-Jan-09
2004	Eraser Big	22	110	8	02-Dec-09
2009	Ball Pen 0.5	21	180	18	03-Nov-09



Table: SUPPLIERS

Scode	Sname
21	Premium Stationers
23	Soft Plastics
22	Tetra Supply

(b1) Write SQL commands for the following statements: 4

- (i) To display details of all the items in the Store table in ascending order of LastBuy.
- (ii) To display ItemNo and Item name of those items from Store table whose Rate is more than 15 Rupees.
- (iii) To display the details of those items whose Supplier code (Scode) is 22 or Quantity in Store (Qty) is more than 110 from the table Store.
- (iv) To display Minimum Rate of items for each Supplier individually as per Scode from the table Store.

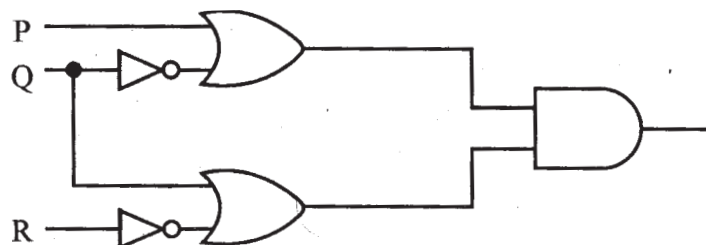
(b2) Give the output of the following SQL queries: 2

- (i) `SELECT COUNT(DISTINCT Scode) FROM Store;`
- (ii) `SELECT Rate*Qty FROM Store WHERE ItemNo=2004;`
- (iii) `SELECT Item,Sname FROM Store S, Suppliers P`  
`WHERE S.Scode=P.Scode AND ItemNo=2006;`
- (iv) `SELECT MAX(LastBuy) FROM Store;`

6. (a) Verify the following algebraically. 2

$$(A' + B') \cdot (A + B) = A' \cdot B + A \cdot B'$$

(b) Write the equivalent Boolean Expression for the following Logic circuit: 2



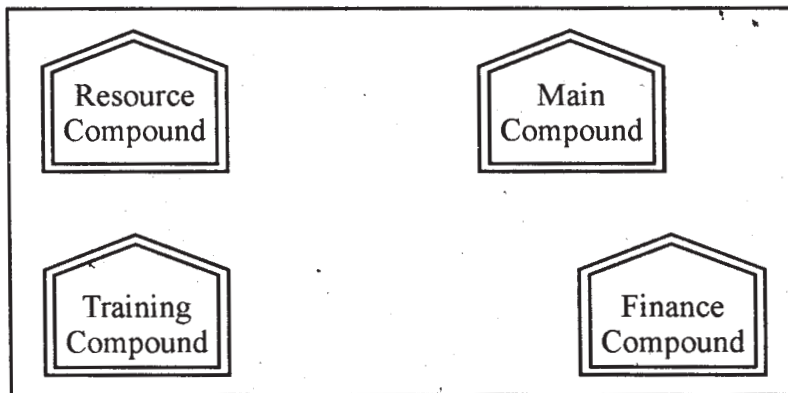
- (c) Write the POS form of a Boolean function H, which is represented in a truth table as follows: 1

X	Y	Z	H
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

- (d) Reduce the following Boolean Expression using K-Map : 3

$$F(U, V, W, Z) = \Sigma(3, 5, 7, 10, 11, 13, 15)$$

7. (a) What was the role of ARPANET in the Computer Network? 1
- (b) Which of the following is not an unit for data transfer rate? 1
- (i) bps
- (ii) abps
- (iii) gbps
- (iv) kbps
- (c) What is the difference between Trojan Horse and Virus in terms of computers? 1
- (d) What term we use for a software/hardware device, which is used to block, unauthorized access while permitting authorized communications. This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria. 1
- (e) “Learn Together” is an educational NGO. It is setting up its new campus at Jabalpur for its webbased activities. The campus has 4 compounds as shown in the diagram below: 4



Center to center distances between various Compounds as per architectural drawings (in Metre) is as follows :

Main Compound to Resource Compound	110 m
Main Compound to Training Compound	115 m
Main Compound to Finance Compound	35 m
Resource Compound to Training Compound	25 m
Resource Compound to Finance Compound	135 m
Training Compound to Finance Compound	100 m

Expected Number of Computers in each Compound is as follows :

Main Compound	5
Resource Compound	15
Training Compound	150
Accounts Compound	20

- (e1) Suggest a cable layout of connections between the compounds.
- (e2) Suggest the most suitable place (i.e. compound) to house the server for this NGO. Also, provide a suitable reason for your suggestion.
- (e3) Suggest the placement of the following devices with justification :

- (i) Repeater
  - (ii) Hub/Switch
- (e4) The NGO is planning to connect its International office situated in Mumbai, which out of the following wired communication link, you will suggest for a very high speed connectivity?
- (i) Telephone Analog Line
  - (ii) Optical Fiber
  - (iii) Ethernet Cable
- (f) Write the full forms of the following: 1
- (f1) GNU
  - (f2) XML
- (g) Write one advantage of each for Open Source Software and Proprietary Software. 1

### QUESTION PAPER CODE 91

1. (a) What is the difference between call by value and call by reference? Also, give a suitable C++ code to illustrate both. 2
- (b) Which C++ header file(s) will be essentially required to be included to run/execute the following C++ code: 1
- ```
void main()
{
    int Rno=24; char Name[] ="Amen Singhania";
    cout<<setw(10)<<Rno<<setw(20)<<Name<<endl;
}
```
- (c) Rewrite the following C++ program code after removing the syntax error(s) (if any). Underline each correction. 2
- ```
include <iostream.h>
class FLIGHT
{
```

```

    long FlightCode;
    char Description[25];
public
    void AddInfo()
    {
        cin>>FlightCode; gets (Description) ;
    }
    void ShowInfo()
    (
        cout<<FlightCode<<":"<<Description<<endl;
    )
} ;
void main()
{
    FLIGHT F;
    AddInfo.F(); ShowInfo.F();
}

```

(d) Find the output of the following program:

3

```

#include <iostream.h>
struct THREE_D
{int X,Y,Z;};
void MoveIn(THREE_D &T, int Step=1)
{
    T.X+=Step;
    T.Y-=Step;
    T.Z+=Step;
}

```

```

}

void MoveOut(THREE_D &T, int Step=1)
{
    T.X-=Step;
    T.Y+=Step;
    T.Z-=Step;
}

void main ()
{
    THREE_D T1={10,20,5},T2={30,10,40};
    MoveIn(T1);
    MoveOut(T2,5);
    cout<<T1.X<<" , "<<T1.Y<<" , "<<T1.Z<<endl;
    cout<<T2.X<<" , "<<T2.Y<<" , "<<T2.Z<<endl;
    MoveIn(T2,10);
    cout<<T2.X<<" , "<<T2.y<<" , "<<T2.Z<<endl;
}

```

(e) Find the output of the following program:

2

```

#include <iostream.h>
#include <ctype.h>
void MyCode (char Msg [], char CH)
{
    for (int (Cnt=0;Msg[Cnt]!='\0';Cnt++)
    {
        if (Msg[Cnt]>='B' && Msg[Cnt]<='G')
            Msg[Cnt]=tolower(Msg[Cnt]);
    }
}

```

```

        else
            if (Msg[Cnt]=='A' || Msg[Cnt]=='a')
                Msg[Cnt]=CH;
        else
            if (Cnt%2==0)
                Msg[Cnt]=toupper(Msg[Cnt]);
            else
                Msg[Cnt]=Msg[Cnt-1];
    }
}
void main ()
{
    char MyText [] =" ApEACeDrIVE";
    MyCode(MyText, '@');
    cout<<"NEW TEXT:"<<MyText<<endl;
}

```

- (f) The following code is from a game, which generates a set of 4 random numbers. Praful is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.

2

```

#include <iostream.h>
#include <stdlib.h>
const int LOW=25;
void main ()
{
    randomize();
    int P01NT=5,Number;
    for (int I=1;I<=4;I++)

```

```

    {
        Number=LOW+random(POINT);
        Cout<<Number<<" : ";
        POINT--;
    }
}

```

(i) 29:26:25:28:

(ii) 24:28:25:26:

(iii) 29:26:24:28:

(iv) 29:26:25:26:

2. (a) What do you understand by Data Encapsulation and Data Hiding ?' Also, give an example in C++ to illustrate both. 2

(b) Answer the questions (i) and (ii) after going through the following class: 2

```

class Exam
{
    int Rno,MaxMarks,MinMarks,Marks;
public:
    Exam( ) //Module 1
    {
        Rno=101;MaxMarks=100;MinMarks=40;Marks=75;
    }
    Exam(int Prno, int Pmarks) //Module 2
    {
        Rno=Prno;MaxMarks=100;MinMarks=40;Marks=Pmarks;
    }
    ~Exam( ) //Module 3

```



```

    {
        cout<<"Exam Over"<<endl;
    }
void Show () //Module 4
{
    cout<<Rno<<": "<<MaxMarks<<": "<<MinMarks<<endl;
    cout<<"[Marks Got]"<<Marks<<endl;
}
};

```

- (i) As per Object Oriented Programming, which concept is illustrated by **Module 1** and **Module 2** together?
- (ii) What is **Module 3** referred as ? When do you think, **Module 3** will be invoked/called?
- (c) Define a class STOCK in C++ with following description: 4

Private Members

- ICode of type integer (Item Code)
- Item of type string (Item Name)
- Price of type float (Price of each item)
- Qty of type integer (Quantity in stock)
- Discount of type float (Discount percentage on the item)
- A member function FindDisc() to calculate discount as per the following rule:

If Qty<=50                      Discount is 0

If 50<Qty<=100                  Discount is 5

If Qty>100                      Discount is 10

Public Members

- A function Buy() to allow user to enter values for ICode, Item, Price, Qty and call function FindDisc() to calculate the Discount.

- A function ShowAll() to allow user to view the content of all the data members.

(d) Answer the questions (i) to (iv) based on the following:

4

```
class Director
{
    long DID;        //Director Identification Number
    char Name[20];

protected:
    char Description[40];
    void Allocate();

public:
    Director();
    void Assign();
    void Show();
} ;

class Ractory:public Director
{
    int FID;        //Factory ID
    char Address[20];

protected:
    int NOE;        //No. of Employees

public:
    Factory();
    void Input();
    void Output();
};

class ShowRoom:private Factory
```

```

{
    int SID;          //Showroom ID
    char City[20];
public:
    ShowRoom();
    void Enter();
    void Display();
};

```

- (i) Which type of inheritance out of the following is illustrated in the above C++ code?
- (a) Single Level Inheritance
- (b) Multi Level Inheritance
- (c) Multiple Inheritance
- (ii) Write the names of data members, which are accessible by objects of class type ShowRoom.
- (iii) Write the names of all member functions which are accessible by objects of class type ShowRoom.
- (iv) Write the names of all members, which are accessible from member functions of class Factory.
3. (a) Write a function REASSIGNO in C++, which accepts an array of integers and its size as parameters and divide all those array elements by 5 which are divisible by 5 and multiply other array elements by 2.

3

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
20	12	15	60	32

Content of the array after calling REASSIGNO function

A[0]	A[1]	A[2]	A[3]	A[4]
4	24	3	12	64

- (b) An array T[90][100] is stored in the memory along the column with each of the elements occupying 4 bytes. Find out the memory location for the element T[10][40], if the Base Address of the array is 7200. 3
- (c) Write a complete program in C++ to implement a dynamically allocated Queue containing names of Cities. 4
- (d) Write a function `int ALTERSUM (int B[ ][5], int N, int M)` in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from B[0][0]. 2

Hint:

If the following is the content of the array

<b>B[0][0]</b>	B[0][1]	<b>B[0][2]</b>
<b>4</b>	5	<b>1</b>
B[1][0]	<b>B[1][1]</b>	B[1][2]
2	<b>8</b>	7
<b>B[2][0]</b>	B[2][1]	<b>B[2][2]</b>
<b>9</b>	6	<b>3</b>

The function should add elements B[0][0], B[0][2], B[1][1], B[2][0] and B[2][2].

- (e) Evaluate the following postfix notation of expression: 2  
 (Show status of Stack after each operation)  
 True, False, NOT, OR, False, True, OR, AND
4. (a) Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using `tellg()` and `seekp()` functions for performing the required task. 1

```
#include <fstream.h>

class Customer
{
    long Cno;char Name[20],Mobile[12];
public:
```

```

        //Function to allow user to enter the Cno, Name,
        Mobile
void Enter();

        //Function to allow user to enter (modify) mobile
        number
void Modify();

        //Function to return value of Cno
        long GetCno () {return Cno;}
};

void ChangeMobile()
{
    Customer C;
    fstream F;
    F.open("CONTACT.DAT",ios::binary|ios::in|ios::out);
    long Cnoc; //Customer no. whose mobile number needs
    to be changed
    cin>>Cnoc;
    while (F.read((char*)& C,sizeof(C)))
    {
        if (Cnoc==C.GetCno())
        {
            C.Modify ();

                                                    //Statement 1
            int Pos=_____//To find the current
                position of file pointer
                                                    //Statement 2
            _____//To move the file pointer to write the
                //modified record back onto the file
                //for the desired Cnoc
            F.write((char*)&C, sizeof(C));
        }
    }
    F.close () ;
}

```

- (b) Write a function in C++ to count the words “to” and “the” present in a text file “POEM.TXT”. 2

[Note that the words “to” and “the” are complete words]

- (c) Write a function in C++ to search and display details. of all trains, whose destination is “Delhi”. from a binary file “TRAIN.DAT”. Assuming the binary file is containing the objects of the following class. 3

```
class TRAIN
{
    int Tno;                // Train Number
    charFrom[20];          // Train Starting Point
    charTo [20];           // Train Destination
public:
    char*   GetFrom(){return From;}
    char*   GetTo(){return To;}
    void   Input(){cin>>Tno;gets(From);gets(To);}
    void   Show(){cout<<Tno<<": "<<From<<": "<<To<<endl;}
};
```

5. (a) What do you understand by Primary Key? Give a suitable example of Primary Key from a table containing some meaningful data. 2
- (b) Consider the following tables STOCK and DEALERS and answer (b1) and (b2) parts of this question:

Table: STOCK

ItemNo	Item	Dcode	Qty	UnitPrice	StockDate
5005	Ball Pen 0.5	102	100	16	31-Mar-10
5003	Ball Pen 0.25	102	150	20	01-Jan-10
5002	Gel Pen Premium	101	125	14	14-Feb-10
5006	Gel Pen Classic	101	200	22	01-Jan-09
5001	Eraser Small	102	210	5	19-Mar-09
5004	Eraser Big	102	60	10	12-Dec-09
5009	Sharpener Classic	103	160	8	23-Jan-09

Table: DEALERS

Dcode	Dname
101	Reliable Stationers
103	Classic Plastics
102	Clear Deals

(b1) Write SQL commands for the following statements:

4

- (i) To display details of all Items in the Stock table in ascending order of StockDate.
- (ii) To display ItemNo and Item name of those items from Stock table whose UnitPrice is more than Rupees 10.
- (iii) To display the details of those items whose dealer code (Dcode) is 102 or Quantity in Stock (Qty) is more than 100 from the table Stock.
- (iv) To display Maximum UnitPrice of items for each dealer individually as per Dcode from the table Stock.

(b2) Give the output of the following SQL queries:

2

- (i) `SELECT COUNT(DISTINCT Dcode) FROM Stock;`
- (ii) `SELECT Qty*UnitPrice FROM Stock WHERE ItemNo=5006;`
- (iii) `SELECT Item,Dname FROM Stock S, Dealers D WHERE S.Dcode=D.Dcode AND ItemNo=5004;`
- (iv) `SELECT MIN(StockDate) FROM Stock;`

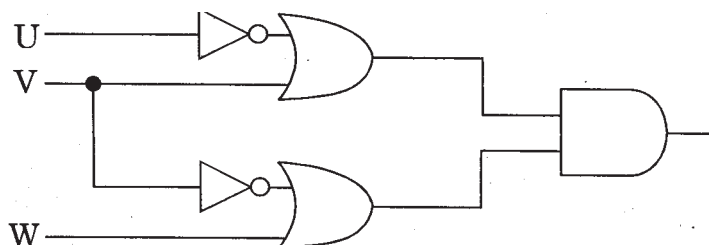
6. (a) Verify the following algebraically :

2

$$X'.Y + X.Y' = (X'+Y').(X+Y)$$

(b) Write the equivalent Boolean Expression for the following Logic Circuit:

2



- (c) Write the SOP form of a Boolean function G, which is represented in a truth table as follows: 1

P	Q	R	G
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

- (d) Reduce the following Boolean Expression using K-Map : 3  
 $F(A,B,C,D) = \Sigma(3,4,5,6,7,13,15)$

7. (a) What was the role of ARPANET in the Computer Network? 1

- (b) Which of the following is not a unit for data transfer rate? 1

(i) mbps

(ii) kbps

(iii) sbps

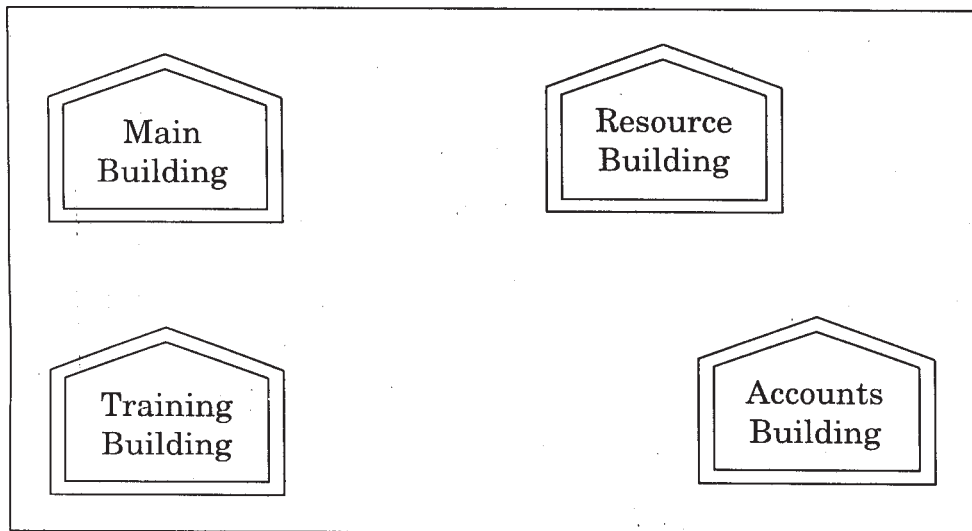
(iv) gbps

- (c) What is the difference between Virus and Worms in the computers? 1

- (d) What term do we use for a software/hardware device, which is used to block unauthorized access while permitting authorized communications? This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria. 1

- (e) “Vidya for All” is an educational NGO. It is setting up its new campus at Jaipur for its web-based activities. The campus has four buildings as shown in the diagram below: 4





Center to center distances between various buildings as per architectural drawings (in meters) is as follows:

Main Building to Resource Building	120 m
Main Building to Training Building	40 m
Main Building to Accounts Building	135 m
Resource Building to Training Building	125 m
Resource Building to Accounts Building	45 m
Training Building to Accounts Building	110 m

Expected Number of Computers in each Building is as follows:

Main Building	15
Resource Building	25
Training Building	250
Accounts Building	10

- (e1) Suggest a cable layout of connections between the buildings.
- (e2) Suggest the most suitable place (i.e. building) to house the server for this NGO. Also, provide a suitable reason for your suggestion.
- (e3) Suggest the placement of the following devices with justification:
  - (i) Repeater
  - (ii) Hub/Switch

- (e4) The NGO is planning to connect its International office situated in Delhi. Which out of the following wired communication links, will you suggest for a very high speed connectivity ?
- (i) Telephone Analog Line
  - (ii) Optical Fiber
  - (iii) Ethernet Cable
- (f) Write the full forms of the following: 1
- (f1) FTP
  - (f2) FSF
- (g) Name any two common Web browsers. 1

## Marking Scheme — Computer Science

### **General Instructions :**

1. The answers given in the marking scheme are SUGGESTIVE, Examiners are requested to award marks for all alternative correct Solutions / Answers conveying the similar meaning
2. All programming questions have to be answered with respect to C++ Language only.
3. In C++, ignore case sensitivity for identifiers  
(Variable/Functions/Structures/Class Names)
4. In SQL related questions - both ways of text/character entries should be acceptable for Example: “AMAR” and ‘amar’ both are correct.
5. In SQL related questions - all date entries should be acceptable for Example: 'DD-Mon-YY', "DD/MM/YY", 'DD/MM/YY', "DD/MM/YY", "MM/DD/YY", 'MM/DD/YY', and {MM/DD/YY} are correct.
6. In SQL related questions - semicolon should be ignored for terminating the SQL statements
7. In SQL related questions, ignore case sensitivity.

QUESTION PAPER CODE 91/1

### **EXPECTED ANSWERS**

1. (a) What is the difference between automatic type conversion and type casting?  
Also, give a suitable C++ code to illustrate both. 2

Ans. Automatic Type Conversion: it is an implicit process of conversion of a data from one type to another. For example

```
int N = 65;  
  
char C = N; // Automatic type conversion  
  
cout<<C;
```

OUTPUT:

A

Type Casting: It is an explicit process of conversion of a data from one type to another. For example

```
int A=1, B=2;
float C = (float)A/B; //Type Casting
cout<<C;
```

OUTPUT:

0.5

(½ Mark for each correct explanation of Automatic Type Conversion and Type Casting)

(½ Mark for each correct example of Automatic Type Conversion and Type Casting)

**OR**

(Full 2 Marks for correct example(s) demonstrating the meaning of / difference between Automatic Type Conversion and Type Casting)

**OR**

(Only 1 Mark to be awarded if Explanation without supporting examples)

Note: Output is optional

- (b) Which C++ header file(s) will be essentially required to be included to run/ execute the following C++ code?

**1**

```
void main( )
{
    int Eno=123, char Ename[ ]="Rehan Swamp";
    cout<<setw(5)<<Eno<<setw(25)<<EName<<endl;
}
```

Ans. (i) `iostream.h`      (ii) `iomanip.h`

**OR**

`iomanip.h` - (As `iostream.h` is included in `iomanip.h`)

(½ Mark for writing each correct header file)

**OR**

(Full 1 Mark for mentioning only `iomanip.h` )

Note: Ignore any other header files, if mentioned.

- (c) Rewrite the following c++ program code after removing the syntax error(s) (if any). Underline each correction.

2

```
include <iostream.h>

class TRAIN
{
    long TrainNo;
    char Description[25];

public
    void Entry ( )
    {
        cin >>TrainNo; gets(Description);
    }

    Void Display ( )
    {
        cout<<TrainNo<<":"<<Description<<endl;
    }
};

void main( )
{
    TRAIN T;
    Entry. T( ); Display. T( );
}
```

Ans. #include<iostream.h>

#include<stdio.h>

```
class TRAIN
{
    long TrainNo;
```

```

        char Description [25];
public:
    void Entry  ()
    {
        cin>>TrainNo; gets (Description);
    }
    void Display ()
    {
        cout<<TrainNo<<":"<<Description<<endl;
    }
};
void main ()
{
    TRAIN T;
    T.Entry(); T.Display();
}

```

*(½ Mark for writing # before include<iostream.h>*

*(½ Mark for writing # include <stdio.h>*

*(½ Mark for writing: after public)*

*(½ Mark for writing T.Entry(); and T.Display(); correctly)*

(d) Find the output of the following program :

**3**

```

#include <iostream.h>
struct POINT
{int X, Y, Z};
void StepIn(POINT & P, int Step=1)
{

```

```

        P.X+=Step;

        P.Y-=Step;

        P.Z+=Step;
    }

void StepOut(POINT & P, int Step=1)
{
    P.X-=Step;

    P.Y+=Step;

    P.Z-=Step;
}

void main ( )
{
    POINT P1={15, 25, 5}, P2={10, 30, 20};

    StepIn(P1);

    StepOut(P2,4);

    cout<<P1.X<<" , "<<P1.Y<<" , "<<P1.Z<<endl;

    cout<<P2.X<<" , "<<P2.Y<<" , "<<P2.Z<<endl;

    StepIn(P2,12);

    cout<<P2.X<<" , "<<P2.Y<<" , "<<P2.Z<<endl;
}

```

Ans. 16, 24, 6

6, 34, 16

18, 22, 28

*(1 Mark for each line with -correct values)*

**OR**

*(1/2 Mark for any two correct values in each line)*

*Note:*

*Deduct (1/2 Mark if any/all ', ' missing*

*Deduct (1/2 Mark if endl is not considered at the right positions*

(e) Find the output of the following program :

**2**

```
#include <iostream.h>
#include <ctype.h>
void ChangeIt(char Text[ ], char C)
{
    for (int K=0;Text[K]!='\0';K++)
    {
        if (Text[K]>='F' && Text[K]<='L')
            Text[K]=tolower (Text[K]);
        else
            if (Text[K]=='E' || Text[K]=='e')
                Text[K]=C;
            else
                if (K%2==0)
                    Text[K]=toupper(Text[K]);
                else
                    Text[K]=Text[K-1];
    }
}
void main ( )
{
    char OldText[ ]="pOwERALone";
    ChangeIt(OldText, '%');
    cout<<"New TEXT:"<<OldText<<endl;
}
```



Ans. New TEXT : PPW % RR11N%

*(½ Mark for writing PPW as the first three characters)*

*(½ Mark for writing %RR as the next three characters)*

*(½ Mark for writing 11 as the next two characters)*

*(½ Mark for writing N% as the next two characters)*

*Note: Deduct X Mark for not mentioning New TEXT :*

- (f) The following code is from a game, which generates a set of 4 random numbers. Yallav is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.

2

```
#include <iostream.h>
#include <stdlib.h>
const int LOW=15;
void main ( )
{
    randomize( ) ;
    int POINT=5, Number;
    for (int I=1;I<=4;I++)
    {
        Number=LOW+random( POINT) ;
        cout<<Number<<" : " ;
        POINT--;
    }
}
```

(i) 19:16:15:18:

(ii) 14:18:15:16:

(iii) 19:16:14:18:

(iv) 19:16:15:16:

Ans. (iv) 19:16:15:16:

Justification is as follows:

I	POINT	Number	
		Minimum	Maximum
1	5	15	19
2	4	15	18
3	3	15	17
4	2	15	16

The only option that satisfies these values is option (iv).

*(1 Mark for mentioning correct option)*

*(1 Mark for any valid justification)*

*Note: Only 1/2 Mark to be given if only options (i) & (iv) are mentioned as correct options; no other combination of options is acceptable;*

2. (a) What do you understand by Polymorphism? Also, give an example in C++ to illustrate the same.

2

Ans. The process of using an -operator or a function in different ways for different set of inputs given is known- as polymorphism. Function overloading is- an example of polymorphism, where the functions having same name with different set of parameters perform different operations.

**Example:**

```
void Disp ( ) //Function 1
{
    cout<<"Hello"<<endl;
}

void Disp(int N) //Function 2
{
    for(int I=1;I<=N;I++)
        cout<<I<<endl;
}
```

```

void Disp (int N,int M) //Function 3
{
    for (int I=N;I<=M; I++)
        cout<<N<<"x"<<I<<"="<<N*I<<endl;
}

void main ( )
{
    int x=5, y=10;
    Disp(x); //Function 2 called-Prints numbers from 1 to 5
    Disp(x,y) ; //Function 3 called- Prints from multiples of 5
                //ranging from 5 to 10
    Disp ( ) ; //Function 1 called- Prints Hello
}

```

*(1 Mark for correct explanation of Polymorphism)*

*(1 Mark for a valid example of Polymorphism)*

- (b) Answer the questions (i) and (ii) after going through the following class:

**2**

```

class TEST
{
    int Regno, Max, Min, Score;
public:
    TEST() //Function 1
    {
        Regno= 101;Max=100;Min=40;Score=75;
    }
    TEST(int Pregno,int Pscore) //Function 2
    {
        Regno=Pregno;Max=100;Min=40;Score=Pscore;
    }
}

```

```

~TEST()                                     //Function 3
{
    cout<<"TEST Over"<<endl;
}
void Display()                               //Function 4
{
    cout<<Regno<<": "<<Max<<": "<<Min<<endl;
    cout<<"[Score]"<<Score<<endl;
}
};

```

- (i) As per Object Oriented Programming, which. concept is illustrated by **Function 1 and Function 2** together?

Ans. Polymorphism

OR

Function Overloading

OR

Constructor Overloading

*(1 Mark for naming the concept correctly)*

- (ii) What is **Function 3** specifically referred as ? When do you think, **Function 3** will be invoked/called?

Ans. Destructor, invoked or called when scope of an Object gets over.

*(1/2 Mark for naming Destructor correctly)*

*(1/2 Mark for mentioning correctly when it is invoked)*

- (c) Define a class ITEM in C++ with following description:

4

Private Members

- Code of type integer (Item Code)
- Iname of type string (Item Name)
- Price of type float (Price of each item)

- Qty of type integer (Quantity of item in stock)
- Offer of type float (Offer percentage on the item)
- A member function GetOffer() to calculate Offer percentage as per the following rule:

If Qty<=50            Offer is 0

If 50<Qty<=100      Offer is 5

If Qty>100           Offer is 10

#### Public Members

- A function GetStock() to allow user to enter values for Code, Iname, Price, Qty and call function GetOffer() to calculate the offer
- A function ShowItem() to allow user to view the content of all the data members

Ans. class ITEM

```
{
    int Code;
    char Iname [20] ;
    float Price;
    int Qty;
    float Offer;
    void GetOffer() ;

public:
    void GetStock ()
    {
        cin>>Code;
        gets (Iname) ; // OR cin.getline (Iname, 80) ; OR cin>>Iname;
        cin>>Price>>Qty;
        GetOffer() ;
    }
}
```

```

}
void ShowItem ()
{
    cout<<Code<<Iname<<Price<<Qty<<Offer;
};
void ITEM::GetOffer ()
{
    if (Qty<=50)
        Offer = 0;
    else if (Qty <=100)
        Offer = 5; //OR Offer = 0.05;
    else
        Offer = 10; //OR Offer = 0.1;
}

```

*(½ Mark for correct syntax for class header)*

*(½ Mark for correct declaration of data members)*

*(1 Mark for correct definition of GetOffer())*

*(1 Mark for correct definition of GetStock () with proper invocation of GetOffer() function)*

*(1 Mark for correct definition of ShowItem())*

**NOTE:**

*Deduct ½ Mark if GetOffer() is not invoked properly inside GetStock()function*

(d) Answer the questions (i) to (iv) based on the following:

**4**

```

class Chairperson
{
    long CID;          //Chairperson Identification Number
    char CName[20];

protected:
    char Description [40];
}

```

```

        void Allocate();
public:
        Chairperson();
        void Assign();
        void Show();
};
class Director
{
        int DID;                //Director ID
        char Dname[20];
protected:
        char Profile[30];
public:
        Director();
        void Input();
        void output();
};
class Company: private Chairperson, public Director
{
        int CID;                //Company ID
        char City[20], Country[20];
public:
        Company();
        void Enter();
        void Display();
};

```

(i) Which type of inheritance out of the following is specifically is illustrated in the above C++ code?

- (a) Single Level Inheritance
- (b) Multi Level Inheritance
- (c) Multiple Inheritance

Ans. (c) Multiple Inheritance

*(1 Mark for writing correct inheritance type)*

(ii) Write the names of data members, which are accessible by objects of class type Company.

Ans None

*(1 Mark for writing None or No data members)*

(iii) Write the names of all member functions, which are accessible by objects of class type Company.

Ans. Enter(), Display(), Input(), output()

*(1 Mark for writing correct member functions)*

*Note:*

- *Both output() or Output() are acceptable as correct answer since differentiation between small and capital O is very difficult.*
- *No marks to be awarded for any other alternative answer*
- *Ignore mention of Constructor(s)*

(iv) Write the names of all members, which are accessible from member functions of class Director.

Ans. Input(), output(), Profile, Dname, DID

*(1 Mark for writing correct members)*

*Note:*

- *Both output() or Output() are acceptable as correct answer since differentiation between small and capital O is very difficult.*
- *No marks to be awarded for any other alternative answer*
- *Ignore mention of Constructor(s)*



3. (a) Write a function CHANGE in C++, which accepts an array of integer and its size as parameters and divide all those array elements by 7 which are divisible by 7 and multiply other-array elements by 3. 3

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
21	12	35	42	18

Content of the array after Calling CHANGE() function

A[0]	A[1]	A[2]	A[3]	A[4]
3	36	5	6	54

Ans. void CHANGE (int A[ ], int N)

```
{
    for(int I = 0; I<N; I++)
    {
        if (A[I]%7 == 0)
            A [I] = A [I] /7;
        else
            A[I] = A[I] * 3;
    }
}
```

OR

Any other correct equivalent function definition

( 1/2 Mark for correct Function Header)

(1/2 Mark for correct loop)

(1/2 Mark for correct checking of divisibility of array elements by 7)

(1/2 Mark for correct else OR correct checking of non divisibility of array elements by 7)

(1/2 Mark for each correct assignment)

- (b) An array P[50] [60] is stored in the memory along the column with each of the element occupying 2 bytes, find out the memory location for the element P[10] [20], if the Base Address of the array is 6800. 3

$$\begin{aligned}
 \text{Ans. Loc}(P[I] [J]) &= \text{Base}(P)+W(I+J*M) \\
 \text{i Loc}(P[10][20]) &= \text{Base}(P)+ 2(10+20*50) \\
 \text{Loc}(P[10] [20]) &= 6800 + 2(10+20*50) \\
 &= 6800 + 2 (10+1000) \\
 &= 6800 + 2*1010 \\
 &= 6800 + 2020 \\
 &= 8820
 \end{aligned}$$

OR

$$\begin{aligned}
 \text{Address of } P[i] [j] &= \text{BaseAddress} + W((i-L1)+(j-L2)*M) \\
 \text{Address of } P[10] [20] &= 6800 + 2((10-0)+(20-0)x50) \\
 &= 6800 + 2 x 1010 \\
 &= 6800 + 2020 \\
 &= 8820
 \end{aligned}$$

OR

$$\begin{aligned}
 \text{Address of } P[I] [J] \text{ along the column} \\
 &= \text{BaseAddress} + W((I-LBR)+(J-LBC)*M) \\
 &\text{(where N is the number of rows, LBR = LBC = 1)} \\
 \text{Address of } P[10][20] &= 6800+2((10-1)+(20-1)x50) \\
 &= 6800 + 2 ( 9 + 19 x 50 ) \\
 &= 6800 + 2 x 959 \\
 &= 6800 + 1918 \\
 &= 8718
 \end{aligned}$$

*(1 Mark for writing correct formula (for column major) OR substituting formula with correct values for calculating Address)*

*(2 marks for calculating correct address)*

- (c) Write a complete program in c++ to implement a dynamically allocated Stack containing names of Countries.

```

Ans. #include<iostream.h>
#include<stdio.h>
struct Node
{
    char Country [20] ;
    Node *Link;
};
class Stack
{
    Node *Top;
public:
    Stack() {Top = NULL;}
    void Push() ;
    void Pop() ;
    void Display() ;
    ~Stack () ;
};
void Stack::Push()
{
    Node *Temp = new Node;
    gets(Temp -> Country);
    Temp -> Link = Top;
    Top = Temp;
}
void Stack::Pop()
{
    if (Top !=NULL)

```

```

    {
        Node *Temp = Top;
        Top = Top -> Link;
        delete Temp;
    }
    else
        cout<<"stack Empty";
}

void Stack::Display()
{
    Node *Temp = Top;
    while (Temp! = NULL)
    {
        cout<<Temp -> Country <<endl;
        Temp = Temp -> Link;
    }
}

Stack::~~Stack ()
{
    while (Top!=NULL)
    {
        NODE *Temp=Top;
        Top=Top->Link;
        delete Temp;
    }
}

```

```

void main ( )
{
    Stack ST; char Ch;
    do
    {
        cout<<"p/O/D/Q" ;
        cin>>Ch;
        switch (Ch)
        {
            case 'P' : ST.Push(); break;
            case 'O' :ST.Pop(); break;
            case 'D' :ST.Disp();
        }
    } while (Ch!='Q');
}

```

- (d) Write a function `int SKIPSUM(int A[ ][3], int N,int M)` in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from `A[0][0]`.

2

Hint:

If the following is the content of the array

A[0][0]	A[0][1]	A[0][2]
4	5	1
A[1][0]	A[1][1]	A[1][2]
2	8	7
A[2][0]	A[2][1]	A[2][2]
9	6	3

The function SKIPSUM() should add elements A[0][0], A[0][2], A[1][1], A[2][0] and A[2][2].

Ans. `int SKIPSUM(int A[ ][ 3 ], int N,int M)`

```
{
    int S=0;
    for(int I = 0; I < N; I++)
        for (int J = (I%2)?1:0; J<M; J = J+2)
            S = S + A [I][J];
    return S;
}
```

OR

`int SKIPSLJM(int A[ ][3], int N, int M)`

```
{
    int S=0;
    for (int I = 0; I < N; I++)
        for (int J = (I%2==0)? 0:1 ; J<M; J = J+2)
            S = S + A [I][J];
    return S;
}
```

OR

`int SKIPSUM(int A[][3], int N, int M)`

```
{
    int I,J, S=0;
    for (I = 0; I < N; I++)
    {
        if (I%2) //OR (I%2 !=0 ) OR (I%2 == 1)
            J = 1;
    }
}
```

```

        else
            J = 0;
        for ( ; J<M; J = J+2)
            S = S + A[I][J];
    }
    return S;
}

OR

int SKIPSUM(int A[][3], int N, int M)
{
    int S=0, C=0;
    for(int I = 0; I< N; I++)
        for (int J = 0; J<M; J++ )
            {
                if (C%2 == 0)
                    S = S + A[I][J];
                C++;
            }
    return S;
}

OR

int SKIPSUM(int A[][3], int N, int M)
{
    int S=0, C=1;
    for(int I = 0; I<N; I++)
        for (int J = 0; J<M; J++ )

```

```

        {
            if (C%2 != 0)
                S = S + A[I][J];
            C++;
        }
    return S;
}

```

OR

```

int SKIPSUM (int A[][3], int N, int M)
{
    int S=0;
    for(int I = 0; I < N; I++)
        for (int J = 0; J < M; J++ )
            {
                if ((I+J)%2 == 0)
                    S = S + A[I][J];
            }
    return S;
}

```

OR

Any other correct equivalent function definition

*(½ Mark for correct function header)*

*(½ Mark for each correct loop)*

*(½ Mark for checking alternate cells)*

*(½ Mark for finding Sum of elements)*

*(½ Mark for returning the Sum)*



(e) Evaluate the following postfix notation of expression:

(Show status of Stack after each operation)

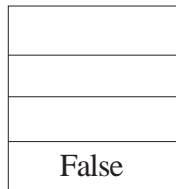
False, True, NOT, OR, True, False, AND, OR

Ans.	Element Scanned	Stack
	False	False
	True	False, True
	NOT	False, False
	OR	False
	True	False, True
	False	False, True, False
	and	False, False
	OR	False

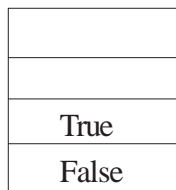
RESULT = False

OR

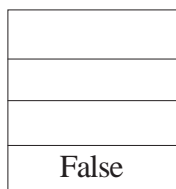
Step 1: Push



Step 2: Push

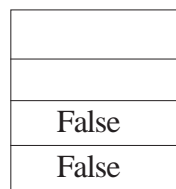


Step 3: NOT



Pop  
Op2=True

Push



Step 4 OR

False
False

Pop  
Op2=False

False

Pop  
Op1 =False  
Op2=False

Push

False

Step 5: Push

True
False

Step 6: Push

False
True
False

Step 7: AND

True
False

Pop  
Op2=False

False

Pop  
Op1=False  
Op2=False

Push

False
False

Step 8: OR

False

Pop  
Op2=False


Pop  
Op1=False  
Op2=False

Push

False

Step 9: Pop


Result  
False

OR

Any other method for evaluating the given postfix expression showing the Stack Status.

*(1/2 Mark for correctly evaluating expression up to each operator*

*(1 Mark only to be given for writing correct answer without showing the Stack Status)*

4. (a) Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using `tellg()` and `seekp()` functions for performing the required task.

1

```
#include <fstream.h>

class Client
{
    long Cno; char Name[20], Email[30] ;

public:
    //Function to allow user to enter the Cno, Name,
    Email void Enter() ;

    //Function to allow user to enter (modify) Email
    void Modify() ;

    long ReturnCno() {return Cno;}
};

void ChangeEmail()
{
    Client C;
    fstream F;
    F.open ("INFO.DAT",ios::binary|ios::in|ios::out);
    long Cnoc;//Client's no. whose Email needs to be
    changed cin>>Cnoc;
    while (F.read((char*)&C, sizeof(C)))
    {
        if (Cnoc==C.ReturnCno())
        {
            C.Modify();

            //Statement 1

            int Pos = _____//To find the current
            position of file pointer
```

```

// Statement 2
_____//To move the file
pointer to write the
//modified record
back onto the file
//for the desired Cnoc
F.write((char*)&C, sizeof(C));
}
}
F.close();
}

```

Ans. Statement 1:

```
F. tellg ();
```

Statement 2:

```
F. seekp(Pos-sizeof(C)) ;
```

OR

```
F.seekp(-sizeof(C), ios::cur);
```

OR

Any equivalent correct method

(½ Mark for each correct statement)

- (b) Write a function in C++ to count the words “this” and “these” present in a text file “ARTICLE.TXT”.

2

[Note that the words “this” and “these” are complete words]

Ans. void COUNT ( )

```

{
    ifstream Fil;
    Fil.open("ARTICLE.TXT");
    char Word [80]
}

```

OR ifstream Fil("ARTICLE.TXT");

```

int C1 = 0, C2 = 0
while (!Fil.eop())
{
    Fil>>Word;
    if (strcmp(Word,"this") ==0)
        C1++;
    else if (strcmp(Word,"these") ==0)
        C2++;
}
cout<<"Count of -this- in file:"<<C1;
cout<<"Count of -these- in file:"<<C2; }

```

OR cout<<"Count of -this- and -these- -in file:"<<C1+C2;

```

    Fil.close(); //gnore
}
OR
void COUNT( )
{
    if stream Fil("ARTICLE.TXT");
    char Word[80] ;
    int C = 0;
    while(!Fil.eof())
    {
        Fil>>Word;
        if (strcmp(Word,"this")==0||strcmp(Word,"these") ==0)
            C++;
    }
    cout<<"Count of -this- and -these- in file:"<<C;
    Fil.close(); //Ignore
}

```

OR  
ifstream Fil;  
Fil.open("ARTICLE. TXT") ;

```

}
OR
void COUNT( )
{
    ifstream Fil("ARTICLE.TXT");
    //OR fstream Fil;
    // Fil. open("ARTICLE. TXT", ios: : in);
    char STR[10];
    int C1=0, C2=0;
    while (Fil.getline (STR,10, ''))
    {
        if (strcmp(STR,"this")==0)
            C1++;
        else if (strcmp(STR,"these")==0)
            C2++;
    }
}
cout<<"Count of -this- in file:"<<C1;
cout<<"Count of -these- in file:"<<C2; }
Fil.close() ;//Ignore
} OR cout<<"Count of -this- and -these- in file:"<<C1+C2;

```

```

OR
void COUNT ( )
{
    ifstream Fil;
    Fil. open("ARTICLE.TXT"); } OR ifstreamFil("ARTICLE.TXT");
    char Word[80] ,Ch;

```

```

int C1 =0, C2 = 0, I=0;
while(Fil.get(Ch))
{
    if (Ch! = ' ')
        Word[I++] = Ch;
    else
    {
        Word[I] = '\0';
        if (strcmp (Word,"this")==0)
            C1++;
        else if (strcmp(Word,"these")==0)
            C2++;
        I=0,
    }
}
cout<<"Count of -this- in file:" <<C1; }
cout<<"Count of -these- in file:" <<C2; }

```

OR cout<<"Count of -this- and -these- in file: "<<C1+C2;
---

```

Fil.close(); //Ignore

```

```

}

```

OR

Any other correct function definition

*(½ Mark for opening ARTICLE. TXT correctly)*

*(½ Mark for reading each word (Whichever method adopted) from the file)*

*(½ Mark for comparing the word with 'this' and 'these' and incrementing counter(s))*

*(½ Mark for displaying the individual count of 'this' and 'these' or the total count of 'this' and 'these' with/without the Text Message)*

- (c) Write a function in C++ to search and display details of all flights, whose destination is "Mumbai" from a binary file "FLIGHT.DAT". Assuming the binary file is containing the objects of the following class.

3

```
class FLIGHT
{
    int Fno;           //Flight Number
    char From[20];    //Flight Starting Point
    char To[20];      //Flight Destination

public:
    char* GetFrom() {return From;}
    char* GetTo() {return To;}
    void Enter() {cin>>Fno;gets(From);gets(To);}
    void Display(){cout<<Fno<<": " <<From<<": " <<To<<endl;}
};
```

Ans. void Read ()

```
{
    FLIGHT F;
    ifstream fin;
    fin.open("FLIGHT.DAT", ios::binary) ;
    OR ifstream fin ("FLIGHT. DAT", iC;s: :binary) ;
    while(fin.read((char*)&F, sizeof(F)))
    {
        if (strcmp(F. GetTo(),"Mumbai"))
            F.Display() ;
    }
    fin.close(); //Ignore
}
```



OR

```
void Read ()
{
    FLIGHT F;
    ifstream fin;
    fin.open ("FLIGHT. DAT", ios:: binary) ;
    OR ifstream fin ("FLIGHT. DAT" , ios:: binary;
    if (fin)
    {
        fin.read((char*)&F, sizeof (F));
        while(!fin.eof())
        {
            if (strcmp(F. GetTo(),"Mumbai"))
                F.Display();
            fin.read((char*)&F, sizeof(F))
        }
        fin.close(); //Ignore
    }
```

OR

Any other correct function definition

*(½ Mark for opening FLIGHT DAT correctly)*

*(½ Mark for reading each record from FLIGHT.DAT)*

*(½ Mark for correct loop / checking end of file)*

*(1 Mark for comparing value returned by GetTo() with "Mumbai")*

*(½ Mark for displaying the matching record)*

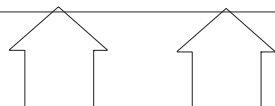
5. (a) What do you understand by Candidate Keys in a table? Give a suitable example of Candidate Keys from a table containing some meaningful data.

2

Ans. A table may have more than one such attribute/group of attribute that identifies a tuple uniquely, all such attribute(s) are known as Candidate Keys.

Table: Item

Ino	Item	Qty
I01	Pen	560
I02	Pencil	780
I04	CD	450
I09	Floppy	700
I05	Eraser	300
I03	Duster	200



*(1 Mark for writing correct definition of Candidate Key)*

*(1 Mark for giving suitable example)*

(b) Consider the following tables STORE and SUPPLIERS

and answer (b1) and (b2) parts of this question:

Table: STORE

ItemNo	Item	Scode	Qty	Rate	LastBuy
2005	Sharpener Classic	23	60	8	31-Jun-09
2003	Ball Pen 0.25	22	50	25	01-Feb-10
2002	Gel Pen Premium	21	150	12	24-Feb-10
2006	Gel Pen Classic	21	250	20	11-Mar-09
2001	Eraser Small	22	220	6	19-Jan-09
2004	Eraser Big	22	110	8	02-Dec-09
2009	Ball Pen 0.5	21	180	18	03-Nov-09

Table: SUPPLIERS

Scode	Sname
21	Premium Stationers
23	Soft Plastics
22	Tetra Supply

(b1) Write SQL commands for the following statements: 4

(i) To display details of all the items in the Store table in ascending order of LastBuy.

Ans. `SELECT * FROM STORE ORDER BY LastBuy;`

(1 Mark for correct query)

(½ Mark for partially correct answer,

(ii) To display ItemNo and Item name of those items from Store table whose Rate is more than 15 Rupees.

Ans. `SELECT ItemNo, Item..In FROM STORE WHERE Rate >15;`

(1 Mark for correct query)

(½ Mark for partially correct answer,

(iii) To display the details of those items whose Supplier code (Scode) is 22 or Quantity in Store (Qty) is more than 110 from the table Store.

Ans. `SELECT * FROM STORE WHERE Scode = 22 OR Qty >110;`

(1 Mark for correct query)

(½ Mark for partially correct answer,

(iv) To display Minimum Rate of items for each Supplier individually as per Scode from the table Store.

Ans. `SELECT Scode, MIN(Rate) FROM STORE GROUP BY Scode;`

(1 Mark for correct query)

(½ Mark for partially correct answer,

(b2) Give the output of the following SQL queries: 2

**Note: In all output Questions ignore Column Headings**

(i) SELECT COUNT(DISTINCT Scode) FROM Store;

Ans. COUNT(DISTINCT Scode)

(½ Mark for correct Output)

(ii) SELECT Rate\*Qty FROM Store WHERE ItemNo=2004;

Ans. RATE\*QTY

880

(½ Mark for correct Output)

(iii) SELECT Item,Sname FROM Store S, Suppliers P WHERE S.Scode=P.Scode AND ItemNo=2006;

Ans. ITEM SNAME

Gel Pen Classic Premium Stationers

(½ Mark for correct Output)

(iv) SELECT MAX>LastBuy) FROM Store;

Ans. MAX (LASTBUY)

24-Feb-10

(½ Mark for correct Output)

6. (a) Verify the following algebraically.

2

$$(A'+B')(A+B)=A'.B+A.B'$$

Ans. LHS

$$(A' + B' ) . (A+B)$$

$$= A' .A + A' .B + A.B' + B' .B$$

$$= 0 + A' .B + A.B'+ 0$$

$$= A' .B + A.B'$$

$$= RHS \quad (\text{Verified})$$

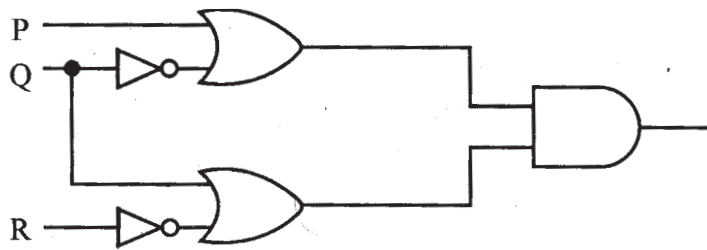
OR

Any other valid algebraic verification

(2 Marks for verifying LHS = RHS OR RHS = LHS )

(b) Write the equivalent Boolean Expression for the following Logic circuit:

2



Ans.  $(P + Q') \cdot (Q + R')$

(2 Marks for the final expression  $(P + Q') \cdot (Q + R')$ )

OR

(1 Mark for any of the correct terms out of  $(P + Q')$  or  $(Q + R')$ )

(c) Write the POS form of a Boolean function H, which is represented in a truth table as follows:

1

X	Y	Z	H
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Ans.  $(X + Y + Z') \cdot (X' + Y + Z') \cdot (X' + Y' + Z)$

OR

$H(X, Y, Z) = \Pi (1, 5, 6)$

(1 Mark for the correct POS form)

Note:

Deduct % mark if wrong variable names are used

(d) Reduce the following Boolean Expression using K-Map :

3

Ans.  $F(U, V, W, Z) = \Sigma (3, 5, 7, 10, 11, 13, 15)$

	$U'V'$	$U'V$	$UV$	$UV'$
$W'Z'$	0	4	12	8
$W'Z$	1	5	13	9
$WZ$	3	7	15	11
$WZ'$	2	6	14	10

OR

	$W'Z'$	$W'Z$	$WZ$	$WZ'$
$U'V'$	0	1	3	2
$U'V$	4	5	7	6
$UV$	12	13	15	14
$UV'$	8	9	11	10

$$F(U, V, W, Z) = WZ + VZ + UV'W$$

(½ Mark for drawing K-Map with correct variable names)

(½ Mark for placing all 1s at correct positions in K-Map)

(½ Mark for each grouping)

(½ Mark for writing final expression in reduced/minimal form)

7. (a) What was the role of ARPANET in the Computer Network?

1

Ans. The first computer network was jointly designed by The Advanced-Research Projects Agency (ARPA) and Department of Defence (DoD) of United States in 1969 and was called ARPANET. It was an experimental project, which connected a few computers from some of the reputed universities of USA and DoD. ARPANET allowed access to computer resource sharing projects. This ARPANET was handed over to Defence Communication Agency (DCA) for further development.

(1 Mark for mentioning that ARPANET was the first computer network)

OR

(½ Mark if only the expansion of ARPANET is mentioned)

- (b) Which of the following is not an unit for data transfer rate? 1
- (i) bps
  - (ii) abps
  - (iii) gbps
  - (iv) kbps

Ans. ( i i ) abps

(1 Mark for writing correct option)

- (c) What is the difference between Trojan Horse and Virus in terms of computers? 1

Ans. TROJAN HORSE: “Malware” computer programs presented as useful or harmless in order to induce the user to install and run them.

VIRUS: Virus is a malicious program that damages data and files and causes harm to computer system.

(1 Mark for mentioning anyone valid difference)

OR

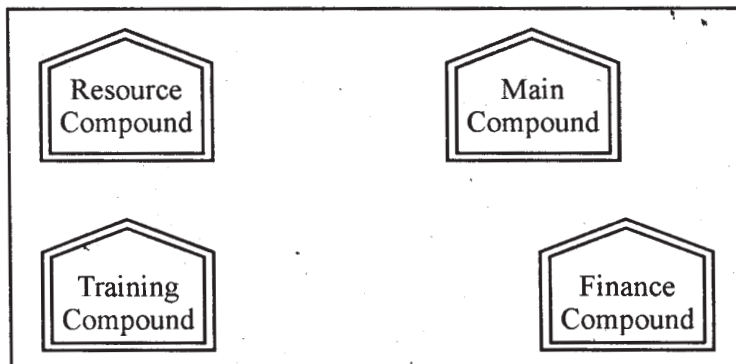
(½ Mark for correct definition of each term)

- (d) What term we use for a software/hardware device, which is used to block, unauthorized access while permitting authorized communications. This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria. 1

Ans. Firewall

(1 Mark for writing correct term)

- (e) “Learn Together” is an educational NGO. It is setting up its new campus at Jabalpur for its webbased activities. The campus has 4 compounds as shown in the diagram below: 4



Center to center distances between various Compounds as per architectural drawings (in Metre) is as follows :

Main Compound to Resource Compound	110 m
Main Compound to Training Compound	115 m
Main Compound to Finance Compound	35 m
Resource Compound to Training Compound	25 m
Resource Compound to Finance Compound	135 m
Training Compound to Finance Compound	100 m

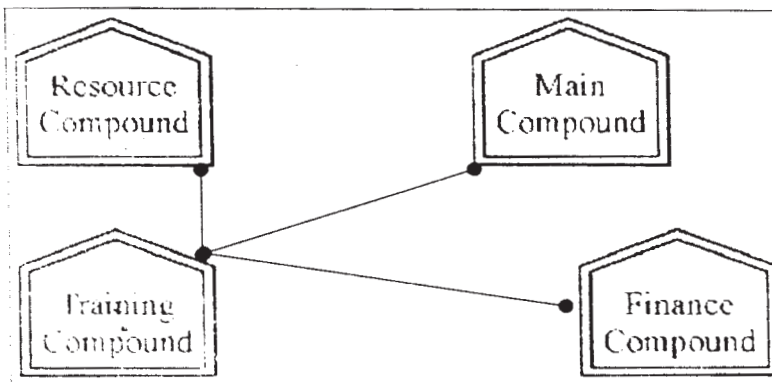
Expected Number of Computers in each Compound is as follows :

Main Compound	5
Resource Compound	15
Training Compound	150
Accounts Compound	20

(e1) Suggest a cable layout of connections between the compounds.

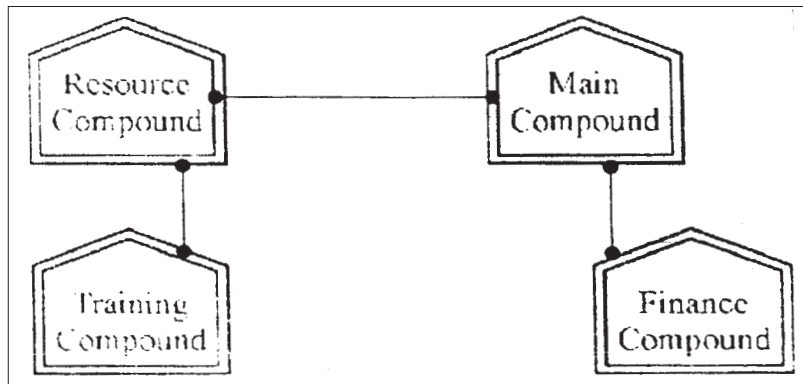
1

Ans.



OR





*(1 Mark for mentioning any valid connectivity or topology or diagram connecting various compounds inside the campus)*

- (e2) Suggest the most suitable place (i.e. compound) to house the server for this NGO. Also, provide a suitable reason for your suggestion. 1

Ans. Training Compound as it contains maximum number of computers.

*(½ Mark for mentioning the correct compound)*

*(½ Mark for correct justification)*

OR

*(1 Mark for any other location with a valid justification)*

- (e3) Suggest the placement of the following devices with justification : 1

- (i) Repeater
- (ii) Hub/Switch

Ans. (i) A Repeater should be placed when the distance between any two connecting compounds exceeds 70 m.

- (ii) Every compound will need one Hub I Switch, to send signals to all of the workstations connected to it

OR

Any diagrammatic representation with valid justification

*(½ Mark for each correct placement of Devices with valid justifications)*

- (e4) The NGO is planning to connect its International office situated in Mumbai, which out of the following wired communication link, you will suggest for a very high speed connectivity? 1

- (i) Telephone Analog Line
- (ii) Optical Fiber
- (iii) Ethernet Cable

Ans. (ii) Optical Fiber

*(1 Mark for correct option /answer)*

(f) Write the full forms of the following: 1

(f1) GNU

(f2) XML

Ans (f1) GNU's not Unix

(f2) eXtensible Markup Language

*(½ Mark for each full form)*

(g) Write one advantage of each for Open Source Software and Proprietary Software. 1

Ans. An Open Source Software is freely and liberally licensed because of which users have right to study, change. and improve its design and source code.

A Proprietary Software has a copyright owner, who can restrict the user's control over the software, its modification, or restrictions in publishing of modified or unmodified versions.

*(½ Mark for writing correct advantage / definition for Open Source Software)*

*(½ Mark for writing correct advantage / definition for Proprietary Software)*

### QUESTION PAPER CODE 91

#### EXPECTED ANSWERS

1. (a) What is the difference between call by value and call by reference? Also, give a suitable C++ code to illustrate both. 2

Ans. Call by value: The formal parameter makes a copy of actual parameter. It does not make the changes In actual parameter If the changes are done In formal parameters.

Call by reference: The formal parameter Is an alias of actual parameter. The changes made In the formal parameter are reflected In actual parameter. It is preceded by &.

```

void Caloulato(int A,int & B )// A is oall by value,
{
    // B is call by roforonco

    A++;

    a+=A;

}

```

*(½ Mark for each corroct explanatIon of Call by va/ueand Call by referenco)*

*(½ Mark for each corroct exampl,of Call by value and Call by reference)*

*OR*

*(Full 2 Marks for correct examples demonstrating tho dlfferonce between Call by value and Call by roforonce)*

*OR*

*(Only 1 Mark to be awarded for ExplanatIon glvon without supporting examples)*

- (b) Which C++ header file(s) will be essentially required to be included to run/ execute the following C++ code:

**1**

```

void main()
{
    int Rno=24; char Name [] =" Amen Singhanian";
    cout<<setw(10)<<Rno<<setw(20)<<Name<<endl;
}

```

Ans. iostream.h

iomanip.h

OR

iomanip.h - (As iostream.h is included in iomanip.h)

*(½ Mark for writing each correct header file)*

*OR*

*(Full Mark for mentioning only iomanip.h )*

*Note: Ignore any other header files, if mentioned.*

- (c) Rewrite the following C++ program code after removing the syntax error(s) (if any). Underline each correction.

2

```
include <iostream.h>

class FLIGHT
{
    long FlightCode;
    char Description[25];

public
    void AddInfo ( )
    {
        cin>>FlightCode; gets (Description) ;
    }
    void ShowInfo ( )
    (
        cout<<FlightCode<<":"<<Description<<endl;
    )
} ;

void main()
{
    FLIGHT F;
    AddInfo.F(); ShowInfo.F();
}
```

Ans. #include <iostream.h> / / Error 1

#include <stdio.h> / / Error 2

```
class FLIGHT
{
    long FlightCode;
```

not required if gets() is replaced with cin.getline() or cin

```

        char Description[25];
public :           / / Error 3
        void AddInfo ( )
        {
            cin>>FlightCode; gets (Description) ;
        }
        void ShowInfo ( )
        {
            cout<<FlightCode<<":"<<Description<<endl;
        }
    } ;
void main ( )
{
    FLIGHT F;
    F.AddInfo( ) ; F. ShowInfo ( ) ; / / Error 4
}

```

*(½ Mark for each correction)*

**OR**

*(1 mark for identifying at least three errors, without suggesting correction)*

(d) Find the output of the following program:

3

```

#include <iostream.h>
struct THREE_D
{int X,Y,Z};
void MoveIn(THREE_D &T, int Step=1)
}

    T.X+=Step;
    T.Y-=Step;

```

```

        T.Z+=Step;
    }
void MoveOut(THREE_D &T, int Step=1)
{
    T.X-=Step;
    T.Y+=Step;
    T.Z-=Step;
}
void main ()
{
    THREE_D T1={10,20,5},T2={30,10,40};
    MoveIn(T1);
    MoveOut(T2,5) ;
    cout<<T1.X<<" , "<<T1.Y<<" , "<<T1.Z<<endl;
    cout<<T2.X<<" , "<<T2.Y<<" , "<<T2.Z<<endl;
    MoveIn(T2,10);
    cout<<T2.X<<" , "<<T2.y<<" , "<<T2.Z<<endl;
}

```

Ans. 11, 19, 6

25, 15, 35

35, 5, 45

*(1 Mark for each line with correct values)*

**OR**

*(1/2 Mark for any two correct values in each line)*

*Note:*

*Deduct 1/2 Mark if any/all ',' missing*

*Deduct 1/2 Mark if endl is not considered at the right positions*

(e) Find the output of the following program:

2

```
#include <iostream.h>
#include <ctype.h>
void MyCode (char Msg [], char CH)
{
    for (int (Cnt=0;Msg[Cnt]!='\0';Cnt++)
    {
        if (Msg[Cnt]>='B' && Msg[Cnt]<='G')
            Msg[Cnt]=tolower(Msg[Cnt]);
        else
            if (Msg[Cnt]=='A' || Msg[Cnt]=='a')
                Msg[Cnt]=CH;
            else
                if (Cnt%2==0)
                    Msg[Cnt]=toupper(Msg[Cnt]);
                else
                    Msg[Cnt]=Msg[Cnt-1];
    }
}
void main ()
{
    char MyText [] = " ApEACeDrIVE";
    MyCode(MyText, '@');
    cout<<"NEW TEXT:"<<MyText<<endl;
}
```

Ans. NEW TEXT :@@e@ccddIIe

(½ Mark for writing @,@,e as the first three characters)

(1/2 Mark for writing @,c,c as the next three characters)

(1/2 Mark for writing d,d, I as the next three characters)

(1/2 Mark for writing I,e as the next two characters)

Note:Deduct 1/2 Mark for not mentioning NEW TEXT:

- (f) The following code is from a game, which generates a set of 4 random numbers. Praful is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.

2

```
#include <iostream.h>
#include <stdlib.h>
const int LOW=25;
void main ()
{
    randomize() ;
    int POINT=5,Number;
    for (int I=1;I<=4;I++)
    {
        Number=LOW+random(POINT);
        Cout<<Number<<" ";
        POINT--;
    }
}
```

(i) 29:26:25:28:

(ii) 24:28:25:26:

(iii) 29:26:24:28:

(iv) 29:26:25:26:

Ans. (iv) 29:26:25:26:

Justification is as follows:



I	POINT	Number	
		Minimum	Maximum
1	5	25	29
2	4	25	28
3	3	25	27
4	2	25	26

The only option that satisfies these values is option (iv).

*(1 Mark for mentioning correct option)*

*(1 Mark for any valid justification)*

*Note: Only ½ Mark to be given if only options (i) & (iv) are mentioned as correct options; no other combination of options is acceptable;*

2. (a) What do you understand by Data Encapsulation and Data Hiding ? Also, give an example in C++ to illustrate both.

2

Ans. Data Encapsulation: Wrapping up of data and functions together in a single unit is known as Data Encapsulation. In a class, we wrap up the data and functions together in a single unit.

Data Hiding: Keeping the data in private/protected visibility mode of the class to prevent it from accidental change is known as Data Hiding.

```
class Computer
{
    char CPU[10] ;int RNM;    //Data Hiding
public:                      //Data Encapsulation
    void STOCK();
    void SHOW();
};
```

*(½ Mark for each correct explanation of Data Encapsulation and Data Hiding)*

*(½ Mark for each correct example of Data Encapsulation and Data Hiding)*

OR

(2 Marks for explaining the concept of the terms through suitable examples)

OR

(Only 1 Mark to be awarded for Explanation given without any example)

- (b) Answer the questions (i) and (ii) after going through the following class:

2

```
class Exam
{
    int Rno,MaxMarks,MinMarks,Marks;
public:
    Exam ( ) //Module 1
    {
        Rno=101;MaxMarks=100;MinMarks=40;Marks=75;
    }
    Exam (int Prno, int Pmarks) //Module 2
    {
        Rno=Prno;MaxMarks=100;MinMarks=40;Marks=Pmarks;
    }
    ~Exam ( ) //Module 3
    {
        cout<<"Exam Over"<<endl;
    }
    void Show ( ) //Module 4
    {
        cout<<Rno<<":"<<MaxMarks<<":"<<MinMarks<<endl;
        cout<<"[Marks Got]"<<Marks<<endl;
    }
};
```

- (i) As per Object Oriented Programming, which concept is illustrated by **Module 1** and **Module 2** together?

Ans. Polymorphism

OR

Constructor Overloading

OR

Function Overloading

*(1 Mark for mentioning the correct concept)*

- (ii) What is **Module 3** referred as ? When do you think, **Module 3** will be invoked/called?

Ans. Destructor. It is invoked as soon as the scope of the object gets over.

*(1/2 Mark for identifying it as Destructor)*

*(1/2 Mark for mentioning correctly when it be called/invoked)*

- (c) Define a class STOCK in C++ with following description:

4

Private Members

- ICode of type integer (Item Code)
- Item of type string (Item Name)
- Price of type float (Price of each item)
- Qty of type integer (Quantity in stock)
- Discount of type float (Discount percentage on the item)
- A member function FindDisc() to calculate discount as per the following rule:

If Qty ≤ 50                      Discount is 0

If 50 < Qty ≤ 100              Discount is 5

If Qty > 100                    Discount is 10

Public Members

- A function Buy() to allow user to enter values for ICode, Item, Price, Qty and call function FindDisc() to calculate the Discount.

- A function ShowAll() to allow user to view the content of all the data members.

```
Ans. class STOCK
{
    int ICode,Qty;
    char Item[20];
    float Price,Discount;
    void FindDisc();
public:
    void Buy();
    void ShowAll();
} ;
void STOCK::Buy()
{
    cin>>ICode;
    gets(Item);
    cin>>Price;
    cin>Qty;
    FindDisc();
}
void STOCK::FindDisc()
{
    if (Qty<=50)
        Discount=0;
    else if (Qty<=100)
        Discount=5;        // =0.05;
    else
```

```

        Discount=10;          // =0.1;
    }
void STOCK::ShowAll()
{
    cout<<ICode<<'\\t'<<Item<<'\\t'<<Price<<'\\t'<<Qty
    <<'\\t'<<Discount<<endl;
}

```

*(½ Mark for correct syntax for class header)*

*(½ Mark for correct declaration of data members)*

*(1 Mark for correct definition of FindDisc())*

*(1 Mark for correct definition of Buy() with proper invocation of FindDisc() function)*

*(1 Mark for correct definition of ShowAll())*

**NOTE:**

*Deduct ½ Mark if FindDisc() is not invoked properly inside Buy() function*

(d) Answer the questions (i) to (iv) based on the following:

4

```

class Director
{
    long DID;          //Director Identification Number
    char Name[20];

protected:
    char Description[40];
    void Allocate () ;

public:
    Director() ;
    void Assign () ;
    void Show () ;
} ;

```

```

class Ractory:public Director
}

    int FID;      //Factory ID
    char Address[20];

protected:

    int NOE;      //No. of Employees

public:

    Factory();

    void Input ();

    void Output ();

};

class ShowRoom:private Factory
{

    int SID;      //Showroom ID
    char City[20];

public:

    ShowRoom();

    void Enter ();

    void Display ();

};

```

(i) Which type of inheritance out of the following is illustrated in the above C++ code?

- (a) Single Level Inheritance
- (b) Multi Level Inheritance
- (c) Multiple Inheritance

Ans. (b) Multilevel Inheritance

*(1 Mark for mentioning correct option)*

- (ii) Write the names of data members, which are accessible by objects of class type ShowRoom.

Ans. None

*(1 Mark for correct answer)*

*Note: No marks to be awarded for any partial/alternative answer*

- (iii) Write the names of all member functions which are accessible by objects of class type ShowRoom.

Ans. Enter(), Display()

*(1 Mark for correct answer)*

*Note:*

*No marks to be awarded for any partial/alternative answer Ignore mention of Constructor(s)*

- (iv) Write the names of all members, which are accessible from member functions of class Factory.

Ans. FID, Address, NOE, Description,

Input(), Output(), Assign(), Show(), Allocate()

*(1 Mark for correct answer)*

*Note:*

*No marks to be awarded for any partial/alternative answer Ignore mention of Constructor(s)*

3. (a) Write a function REASSIGNO in C++, which accepts an array of integers and its size as parameters and divide all those array elements by 5 which are divisible by 5 and multiply other array elements by 2.

3

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
20	12	15	60	32

Content of the array after calling REASSIGNO function

A[0]	A[1]	A[2]	A[3]	A[4]
4	24	3	12	64

Ans. void REASSIGN (int Arr[ ], int Size)

```
{
    for (int i=0;i<Size;i++)
        if (Arr[i]%5==0)
            Arr[i]/=5;
        else
            Arr[i]*=2;
}
```

OR

void REASSIGN(int Arr[ ],int Size)

```
{
    for (int i=0;i<Size;i++)
        Arr[i]%5 ? Arr[i]/=5 : Arr[i]*=2;
}
```

OR

*Any other correct equivalent function definition*

*( 1/2 Mark for correct Function Header)*

*( 1/2 Mark for correct loop)*

*( 1/2 Mark for correct checking of divisibility of array elements by 5)*

*( 1/2 Mark for correct placing of else OR correct checking of non divisibility of array elements by 5)*

*(1/2 Mark for each correct assignment)*

- (b) An array T[90][100] is stored in the memory along the column with each of the elements occupying 4 bytes. Find out the memory location for the element T[10][40], if the Base Address of the array is 7200.

3

Ans.  $Loc(T[I][J]) = Base(T) + W(I + J * N)$

(where N is the number of rows, LBR = LBC = 0)

$= 7200 + 4[10 + 40 \times 90]$



$$\begin{aligned}
&= 7200 + 4[10+3600] \\
&= 7200 + 4 \times 3610 \\
&= 7200 + 14440 \\
&= 21640
\end{aligned}$$

OR

Address of T[I][J] along the column

$$\begin{aligned}
&= \text{BaseAddress} + W [(I-LBR)+(J-LBC)* N] \\
&\text{(where N is the number of rows, LBR=LBC = 1)}
\end{aligned}$$

Address of T[10][40]=BaseAddress + 4[ (10 - 1) +(40 - 1)x 90]

$$\begin{aligned}
&= 7200+4[9 + 39 \times 90] \\
&= 7200+4[9 + 3510] \\
&= 7200+4 \times 3519 \\
&= 7200+14076 \\
&= 21276
\end{aligned}$$

*(1 Mark for writing correct formula (for column major) OR. substituting formula with correct values for calculating Address)*

*(2 marks for calculating correct address)*

- (c) Write a complete program in C++ to implement a dynamically allocated Queue containing names of Cities.

4

```

Ans. #include <iostream.h>

#include <conio.h>

struct NODE
{
    char City[20];
    NODE *Next;
};

class Queue

```

```

{
    NODE *Rear,*Front;
public:
    Queue() {Rear=NULL;Front=NULL;}
    void Qinsert();
    void Qdelete();
    void Qdisplay ();
    ~Queue();
} ;
void Queue::Qinsert()
{
    NODE *Temp;
    Temp=new NODE;
    cout<<"Data:";
    gets (Temp->City);
    Temp->Next=NULL;
    if (Rear==NULL)
    {
        Rear=Temp;
        Front=Temp;
    }
    else
    {
        Rear->Next=Temp;
        Rear=Temp;
    }
}

```

```

}

void Queue::Qdelete()
{
    if (Front!=NULL)
    {
        NODE *Temp=Front;

        cout<<Front->City<<"Deleted \n";

        Front=Front->Next;

        delete Temp;

        if (Front==NULL) Rear=NULL;
    }
    else
        cout<<"Queue Empty..";
}

Queue:: Qdisplay ()
{
    NODE *Temp=Front;

    while (Temp!=NULL)
    {
        cout<<Temp->City<<endl;

        Temp=Temp->Next;
    }
}

Queue::~ ~Queue()//Destructor Function
{
    while (Front!=NULL)
    {

```

```

        NODE *Temp=Front;

        Front=Front->Next; delete Temp;

    }

}

void main ()

{

    Queue QU; char Ch;

    do

    {

        :

        :

    } while (Ch!='Q');

}

```

(4 Marks for correct program)

OR

(Full 4 Marks for correct logic of either Insertion OR Deletion functions for Dynamically Allocated Queue.)

OR

(2 Marks for defining class with Constructor, function prototypes for Insertion & deletion and Destructor or equivalent using Structures.)

- (d) Write a function `int ALTERSUM (int B[ ][5], int N, int M)` in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from `B[0][0]`.

2

Hint: If the following is the content of the array:

<b>B[0][0]</b>	B[0][1]	<b>B[0][2]</b>
<b>4</b>	5	<b>1</b>
B[1][0]	<b>B[1][1]</b>	B[1][2]
2	<b>8</b>	7
<b>B[2][0]</b>	B[2][1]	<b>B[2][2]</b>
<b>9</b>	6	<b>3</b>

The function should add elements B[0][0], B[0][2], B[1][1], B[2][0] and B[2][2].

Ans. //Sample Code 1

```
int ALTERSUM(int B[][5] ,int N,int M)
{
    int Sum=0;
    for (int I=0;I<N;I++)
        for (int J=(I%2==0)?0:1;J<M;J+=2)
            Sum+=B[I][J] ;
    return Sum;
}
```

OR

//Sample Code 2

```
int ALTERSUM(int B[][5],int N,int M)
{
    int Sum=0,J=0;
    for (int I=0;I<N;I++)
    {
        for (;J<M;J+=2)
            Sum+=B[I][J] ;
        J-=M;
    }
    return Sum;
}
```

OR

//Sample Code 3

```
int ALTERSUM(int B[][5],int N,int M)
```

```

{
    int *P=&B[0][0],Sum=0;
    for (int I=0;I<M*N;I+=2)
    {
        Sum+=(*P);
        P+=2;
    }
    return Sum;
}

```

OR

//Sample Code 4

```

int ALTERSUM (int B[][5], int N, int M)
{
    int S=0, C=0;
    for(int I = 0; I < N; I++)
        for (int J = 0; J<M; J++ )
        {
            if (C%2 == 0)
                S = S + B[I][J];
            C++;
        }
    return S;
}

```

OR

//Sample Code 5

```

int ALTERSUM(int B[][5],int N,int M)
{

```

```

int Sum=0;
for (int I=0;I<N;I++)
    for (int J=0;J<M;J++)
        if ((I+J)%2==0)
            Sum+=B [I][J] ;
return Sum;
}

```

OR

//Sample Code 6

```

int ALTERSUM(int B[][5],int N,int M)
{
    int Sum=0;
    for (int I=0;I<N;I++)
        for (int J=0;J<M;J++)
            {
                if ((I%2==0 && J%2==0) || (I%2!=0 && J%2!=0))
                    Sum+=B [I][J] ;
            }
    return Sum;
}

```

Note: Kindly note Sample Code 5 and 6 will not work in case of Even Dimensional Arrays, but keeping in view of the Sample given for 3x3 array the solution is acceptable.

*(1/2 Mark for correct loops)*

*(1 Mark for finding Sum of alternate cells)*

*(1/2 Mark for returning the Sum)*

- (e) Evaluate the following postfix notation of expression:  
(Show status of Stack after each operation)

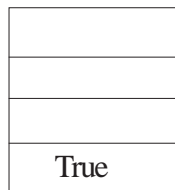
2

True, False, NOT, OR, False, True, OR, AND

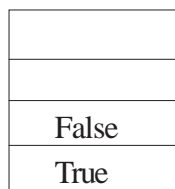
Ans.	Element Scanned	Stack Content
	True	True
	False	True, False
	NOT	True, True
	OR	True
	False	True, False
	True	True, False, True
	OR	True, True
	AND	True

OR

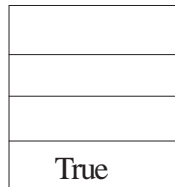
Step 1: Push



Step 2: Push

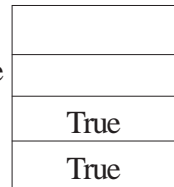


Step 3: NOT

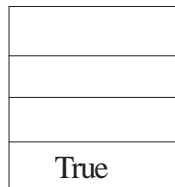


Pop  
Op2=False

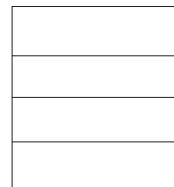
Push



Step 4 OR

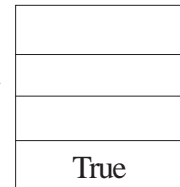


Pop  
Op2=True



Pop  
Op1 =True  
Op2=True

Push





Step 5: Push

False
True

Step 6: Push

True
False
True

Step 7: OR

False
True

Pop  
Op2=True

True

Pop  
Op1=False  
Op2=True

Push

True
True

Step 8: AND

True

Pop  
Op2=True


Pop  
Op1=True  
Op2=True

Push

True

Step 9: Pop


Result  
True

OR

Any other method for evaluating the given postfix expression showing the Stack Status.

*(½ Mark for correctly evaluating expression up to each operator)*

OR

*(1 Mark only to be given for writing correct answer without showing the Stack Status)*

4. (a) Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using tellg() and seekp() functions for performing the required task.

```

#include <fstream.h>

class Customer
{
    long Cno;char Name[20],Mobile[12];

public:
    //Function to allow user to enter the Cno, Name,
    Mobile
void Enter();

    //Function to allow user to enter (modify) mobile
    number void Modify();

    //Function to return value of Cno
    long GetCno () {return Cno;}
};

void ChangeMobile()
{
    Customer C;
    fstream F;
    F.open("CONTACT.DAT",ios::binary|ios::in|ios::out);
    long Cnoc; //Customer no. whose mobile number needs
    to be changed cin>>Cnoc;
    while (F.read((char*)& C,sizeof(C)))
    {
        if (Cnoc==C.GetCno())
        {
            C.Modify ();

                                                    //Statement 1
            int Pos=_____//To find the current
                position of file pointer
                                                    //Statement 2
            _____//To move the file pointer to write the
                //modified record back onto the file

```

```

        //for the desired Cnoc
        F.write((char*)&C,sizeof(C));
    }
}
F. close( ) ;
}

```

Ans. Statement 1:

```
File.tellg() ;
```

Statement 2:

```
File.seekp(Pos-sizeof(C));
```

OR

```
File.seekp(-1*sizeof(C) ,ios::cur);
```

*(1/2 Mark for each correct Statement)*

- (b) Write a function in C++ to count the words “to” and “the” present in a text file “POEM.TXT”.

2

[Note that the words “to” and “the” are complete words]

Ans. void COUNT ( )

```

{
    ifstream Fil;
    Fil. open ("POEM.TXT"); } OR ifstream Fil ("POEM. TXT");
    char Word[80] ;
    int C1 = 0, C2 = 0;
    while(!Fil.eof())
    {
        Fil>>Word;
        if (strcmp (Word, "to") ==0)
            C1++;
        else if (strcmp (Word, "the") ==0)
            C2++;
    }
}

```

```

    }

    cout<<"Count of -to- in file:" <<C1; }
    cout<<"Count of -the- in file:"<<C2; }
    OR cout<<"Count of -to- and -the- in file:"<<C1+C2;
    Fil.close(); //Ignore
}
OR
void COUNT ( )
{
    ifstream Fil("POEM.TXT");
    // OR fstream Fil;
    // Fil.open("POEM.TXT",ios::in);
    char STR[10];
    int C1=0, C2=0;
    while (Fil.getline(STR,10, ''))
    {
        if (strcmp (STR, "to") ==0)
            C1++;
        else if (strcmp(STR, "the") ==0)
            C2++;
    }
    cout<<"Count of -to- in file:"<<C1; }
    cout<<"Count of -the- in file:"<<C2; }
    OR cout<<"Count of -to- and -the- in file:"<<C1+C2;
    Fil.close(); //Ignore
}

```

OR

```
void COUNT()
```

```
{
```

```
    ifstream Fil;
```

```
    Fil. open ("POEM.TXT");
```

```
OR ifstream Fil1("POEM.TXT");
```

```
    char Word[BO], Chi
```

```
    int C1 =0, C2=0, l=0;
```

```
    while(Fil.get(Ch))
```

```
    {
```

```
        if (Ch! = ' ')
```

```
            Word[l++] = Chi
```

```
        else
```

```
        {
```

```
            Word[l] = '\0';
```

```
            if (strcmp (Word, "to") ==0)
```

```
                C1++;
```

```
            else if (strcrap (Word, "the") ==0)
```

```
                C2++;
```

```
            l=0;
```

```
        }
```

```
    }
```

```
    cout<<"Count of -to- in file:"<<C1;
```

```
    cout<<"Count of -the- in file:"<<C2;
```

```
OR cout<<"Count of -to- and -the- in
```

```
    Fil.close(); //ignore
```

```
}
```

OR

Any-other correct function definition

*(½ Mark for opening POEM. TXT correctly)*

*(½ Mark for reading each word (using any method) from the file)*

*(½ Mark for comparing the word with 'to' and 'the')*

*(½ Mark for incrementing counter(s))*

- (c) Write a function in C++ to search and display details. of all trains, whose destination is "Delhi". from a binary file "TRAIN.DAT". Assuming the binary file is containing the objects of the following class.

3

```
class TRAIN
{
    int Tno;                // Train Number
    charFrom[20];          // Train Starting Point
    charTo [20];           // Train Destination
public:
    char*    GetFrom () {return From;}
    char*    GetTo  () {return To;}
    void Input () {cin>>Tno;gets(From);gets(To);}
    void Show  () {cout<<Tno<<":"<<From<<":"<<To<<endl;}
};
```

Ans. void Read ( )

```
{
    TRAIN T;
    ifstream fin;
    fin. open ("TRAIN.DAT", ios::binary);
    OR ifstream fin ("TRAIN.DAT", ios::binary);
    while(fin.read((char*)&T, sizeof(T)))
    {
        if(strcmp(T.GetTo() , "Delhi")==0)
            T.Show() ;
    }
```

```

    }
    fin.close(); //Ignore
}

```

OR

Any other correct function definition

*(1/2 Mark for opening TRAIN .DAT correctly)*

*(1/2 Mark for reading each record from TRAIN.DAT)*

*(1/2 Mark for correct loop / checking end of file)*

*(1 Mark for comparing value returned by GetTo() with "Delhi")*

*(1/2 Mark for displaying the matching record)*


5. (a) What do you understand by Primary Key? Give a suitable example of Primary Key from a table containing some meaningful data.

2

Ans. An attribute or set of attributes which are used to identify a tuple uniquely is known as Primary Key

Table: Item

Ino	Item	Qty
I01	Pen	300
I02	Pencil	780
I04	CD	450
I09	Floppy	700



*(1 Mark for writing correct definition/purpose of valid Primary Key)*

*(1 Mark for giving suitable example)*

OR

*(2 Marks for illustrating the purpose of Key with/without showing it as a part of a Table)*

- (b) Consider the following tables STOCK and DEALERS and answer (b1) and (b2) parts of this question:

Table: STOCK

ItemNo	Item	Dcode	Qty	UnitPrice	StockDate
5005	Ball Pen 0.5	102	100	16	31-Mar-10
5003	Ball Pen 0.25	102	150	20	01-Jan-10
5002	Gel Pen Premium	101	125	14	14-Feb-10
5006	Gel Pen Classic	101	200	22	01-Jan-09
5001	Eraser Small	102	210	5	19-Mar-09
5004	Eraser Big	102	60	10	12-Dec-09
5009	Sharpener Classic	103	160	8	23-Jan-09

Table: DEALERS

Dcode	Dname
101	Reliable Stationers
103	Classic Plastics
102	Clear Deals

(b1) Write SQL commands for the following statements:

4

(i) To display details of all Items in the Stock table in ascending order of StockDate.

Ans. `SELECT * FROM STOCK ORDER BY StockDate;`

*(1 Mark for correct query)*

*(½ Mark for partially correct answer)*

(ii) To display ItemNo and Item name of those items from Stock table whose UnitPrice is more than Rupees 10.

Ans. `SELECT ItemNo,Item FROM STOCK WHERE UnitPrice >10;`

*(1 Mark for correct query)*

*(½ Mark for partially correct answer)*

(iii) To display the details of those items whose dealer code (Dcode) is 102 or Quantity in Stock (Qty) is more than 100 from the table Stock.

Ans. `SELECT * FROM STOCK WHERE Dcode=102 OR Qty >100;`

*(1 Mark for correct query)*

*(½ Mark for partially correct answer)*



- (iv) To display Maximum UnitPrice of items for each dealer individually as per Dcode from the table Stock.

Ans. `SELECT Dcode, MAX (UnitPrice) FROM STOCK GROUP BY Dcode;`

OR

Any other query that will give an equivalent output

*(1 Mark for correct query)*

*(½ Mark for partially correct answer)*

- (b2) Give the output of the following SQL queries:

2

- (i) `SELECT COUNT(DISTINCT Dcode) FROM Stock;`

Ans. Count (DISTINCT Dcode)

3

*(½ Mark for correct output)*

- (ii) `SELECT Qty*UnitPrice FROM Stock WHERE ItemNo=5006;`

Ans. Qty\*UnitPrice

4400

*(½ Mark for correct output)*

- (iii) `SELECT Item,Dname FROM Stock S, Dealers D  
WHERE S.Dcode=D.Dcode AND ItemNo=5004;`

Ans. Item Dname

Eraser Big Clear Deals

*(½ Mark for correct output)*

- (iv) `SELECT MIN(StockDate) FROM Stock;`

Ans. MIN (StockDate)

01-Jan-09

*(½ Mark for correct output)*

6. (a) Verify the following algebraically :

2

$$X'.Y + X.Y' = (X'+Y').(X+Y)$$

Ans. R. H . S

$$\begin{aligned}
 & (X' + Y') \cdot (x + y) \\
 = & x' \cdot (x + y) + Y' \cdot (x + y) \\
 = & x \cdot x' + X' \cdot y + Y' \cdot x + Y' \cdot y \\
 = & x' \cdot y + Y' \cdot X \\
 = & x' \cdot y + x \cdot y'
 \end{aligned}$$

So L.H.S=R.H.S

OR

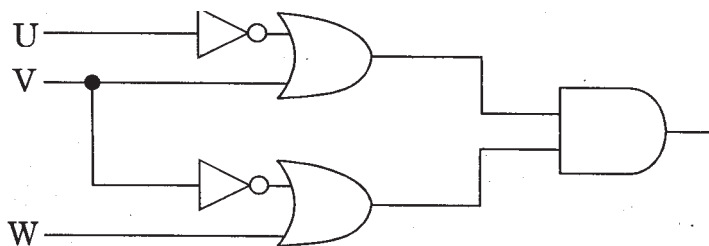
L.H.S.

$$\begin{aligned}
 & X' \cdot Y + X \cdot Y' \\
 = & (X' \cdot Y + X) \cdot (X' \cdot Y + Y') \\
 = & (X' + X) \cdot (Y + X) \cdot (X' + Y') \cdot (Y + Y') \\
 = & 1 \cdot (X + Y) \cdot (X' + Y') \cdot 1 \\
 = & (X + Y) \cdot (X' + Y') \\
 = & \text{R.H.S.}
 \end{aligned}$$

(2 Marks for correct verification)

(b) Write the equivalent Boolean Expression for the following Logic Circuit:

2



Ans.  $(U' + V) \cdot (V' + W)$

(2 Marks for the final expression  $(U' + V) \cdot (V' + W)$ )

OR

(1 Mark for any one of the correct terms out of  $(U' + V)$  or  $(V' + W)$ )

(c) Write the SOP form of a Boolean function G, which is represented in a truth table as follows:

1

P	Q	R	G
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Ans.  $G(P, Q, R) = P' \cdot Q \cdot R' + P' \cdot Q \cdot R + P \cdot Q' \cdot R' + P \cdot Q \cdot R' + P \cdot Q \cdot R$

OR

$$G(P, Q, R) = \Sigma(2, 3, 4, 6, 7)$$

(1 Mark for the correct SOP form)

Note: Deduct 1/2 mark if wrong variable names are used

(d) Reduce the following Boolean Expression using K-Map :

3

$$F(A, B, C, D) = \Sigma(3, 4, 5, 6, 7, 13, 15)$$

Ans.

	A'B'	A'B	AB	AB'
C'D'	0	1	12	8
C'D	1	1	13	9
C'D	1	1	13	11
C'D	2	1	14	10

OR

	C'D'	C'D	CD	CD'
A'B'	0	1	1	2
A'B	1	1	1	1
A'B	12	1	1	14
A'B'	8	9	11	10

$$F(A, B, C, D) = A'B + BD + A'CD$$

*(½ Mark for drawing K-Map with correct variable names)*

*(½ Mark for placing all 1s at correct positions in K-Map)*

*(½ Mark for each grouping)*

*(½ Mark for writing final expression in reduced/minimal form)*

7. (a) What was the role of ARPANET in the Computer Network? 1

Ans. The first computer network was jointly designed by The Advanced Research Projects Agency (ARPA) and Department of Defence (DoD) of United States in 1969 and was called ARPANET. It was an experimental project, which connected a few computers from some of the reputed universities of USA and DoD. ARPANET allowed access to computer resource sharing projects. This ARPANET was handed over to Defence Communication Agency (DCA) for further development.

*(1 Mark for mentioning that ARPANET was the first computer network)*

*OR*

*(½ Mark if only the expansion of ARPANET is mentioned)*

- (b) Which of the following is not a unit for data transfer rate? 1

(i) mbps

(ii) kbps

(iii) sbps

(iv) gbps

Ans. (iii) sbps

*(1 Mark for the correct option/answer)*

- (c) What is the difference between Virus and Worms in the computers? 1

Ans. Virus: Virus is a malicious program that damages data and files and causes harm to computer system.

Worms: Worms disrupt services and create system management problems.

In some cases worms can install viruses that cause damage to system.

*(1 Mark for mentioning anyone valid difference)*

*OR*

*(½ Mark for correct definition of each term)*

- (d) What term do we use for a software/hardware device, which is used to block unauthorized access while permitting authorized communications? This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria.

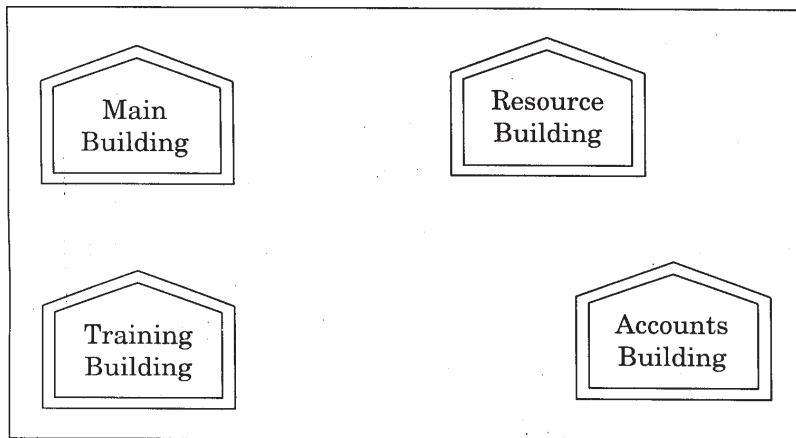
1

Ans. Firewall

(1 Mark for writing correct term)

- (e) “Vidya for All” is an educational NGO. It is setting up its new campus at Jaipur for its web-based activities. The campus has four buildings as shown in the diagram below:

4



Center to center distances between various buildings as per architectural drawings (in meters) is as follows:

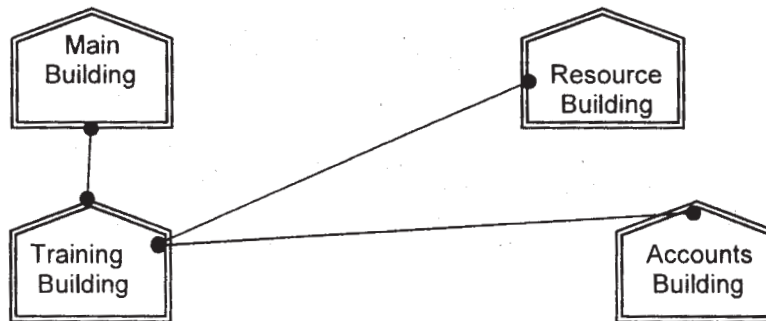
Main Building to Resource Building	120 m
Main Building to Training Building	40 m
Main Building to Accounts Building	135 m
Resource Building to Training Building	125 m
Resource Building to Accounts Building	45 m
Training Building to Accounts Building	110 m

Expected Number of Computers in each Building is as follows:

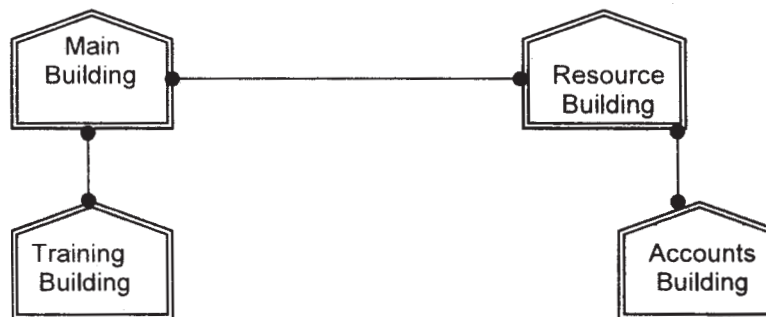
Main Building	15
Resource Building	25
Training Building	250
Accounts Building	10

(e1) Suggest a cable layout of connections between the buildings.

Ans.



OR



*(1 Mark for mentioning any valid connectivity or topology or diagram connecting various buildings inside the campus)*

(e2) Suggest the most suitable place (i.e. building) to house the server for this NGO. Also, provide a suitable reason for your suggestion.

Ans. Training Building as it contains maximum number of computers.

*(½ Mark for mentioning the building)*

*(½ Mark for correct justification)*

OR

*(1 Mark for any other location with a valid justification)*

(e3) Suggest the placement of the following devices with justification:

- (i) Repeater
- (ii) Hub/Switch

Ans. (i) A Repeater should be placed when the distance between any two connecting buildings exceeds 70 m.

- (ii) Every building will need one Hub / Switch, to send signals to all of the workstations connected to it

OR

Any diagrammatic representation with valid justification

*(1/2 Mark for correct placement of Repeater with justification)*

*(1/2 Mark for correct placement of Hub/Switch with justification)*

- (e4) The NGO is planning to connect its International office situated in Delhi. Which out of the following wired communication links, will you suggest for a very high speed connectivity ?

- (i) Telephone Analog Line
- (ii) Optical Fiber
- (iii) Ethernet Cable

Ans. (ii) Optical Fibre

*(1 Mark for correct Option / Answer)*

- (f) Write the full forms of the following:

1

- (f1) FTP
- (f2) FSF

Ans. (f1) FILE TRANSFER PROTOCOL

(f2) FREE SOFTWARE FOUNDATION

*(1/2 Mark. for each full form)*

- (g) Name any two common Web browsers.

1

Ans. Internet explorer

Firefox

Netscape

Chrome

Opera

Safari

OR any other Web Browser

*(1/2 Mark each for any two web browsers)*

# ENGINEERING DRAWING

*Time allowed : 3 hours*

*Maximum Marks : 70*

**Note :**

- (i) Attempt **all** the questions.
- (ii) Use both sides of the drawing sheet, if necessary.
- (iii) All dimensions are in millimeters.
- (iv) Missing and mismatching dimensions, if any, may be suitably assumed.
- (v) Follow the SP : 46-1988 codes  
(with First Angle method of projection).
- (vi) In no view of questions 1 and in no sectioned view of question 3, are hidden edges / lines required.

## QUESTION PAPER CODE 68/1

1. (a) Construct an isometric scale, 90 mm long. 4
- (b) Construct the isometric projection, to isometric scale, of a pentagonal pyramid (base edge = 40 mm and height = 90 mm), keeping it in the inverted position. The axis is perpendicular to H.P. One of its base edges is parallel to V.P. and away from that. Draw the axis and indicate the direction of viewing. Give all dimensions. 8
- (c) A cone (diameter = 40 mm and height = 60 mm) is placed, centrally, with its base on the hexagonal face of a hexagonal prism (base edge = 40 mm and height = 25 mm). The common axis is perpendicular to H.P. The base of the prism is on H.P., and one of the base edges is perpendicular to V.P.
- Draw the isometric projection of the solids, placed together, to isometric scale. Draw the common axis and indicate the direction of viewing. Give all dimensions. 13



2. (a) Draw to scale 1 : 1, the standard profile of a metric thread (internal), taking enlarged pitch = 40 mm. Give standard dimensions.

9

OR

Draw to scale 1 : 1, the front view and top view of a Tee bolt of size M 20. Keep the axis vertical. Give standard dimensions.

- (b) Sketch freehand the front view and top view of a grub screw of size M 25. Keep the axis vertical. Give standard dimensions.

6

OR

Sketch freehand the front view and the top view of a pan head rivet, shank diameter = 20 mm. Keep the axis vertical. Give standard dimensions.

3. Fig. 1 shows the details of a Plummer block. Assemble the parts correctly and draw, to scale 1 : 1, the front view, right half in section.

24

Print title and scale used.

Give 8 important dimensions.

6

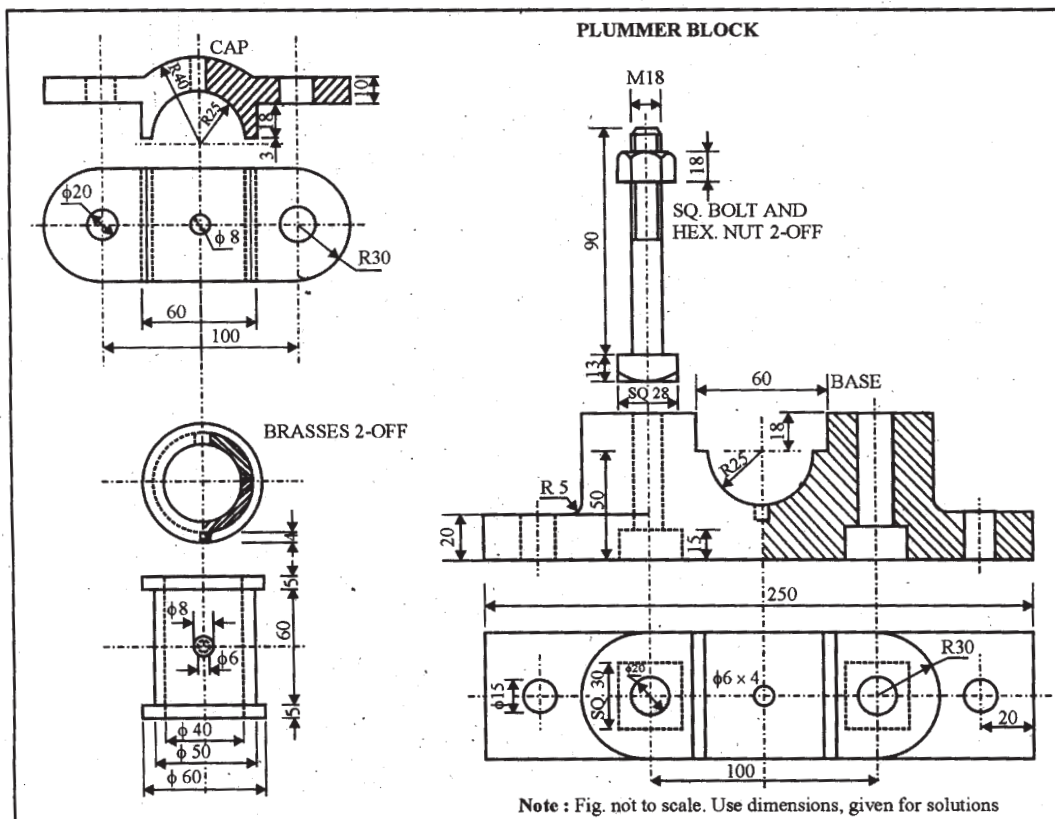


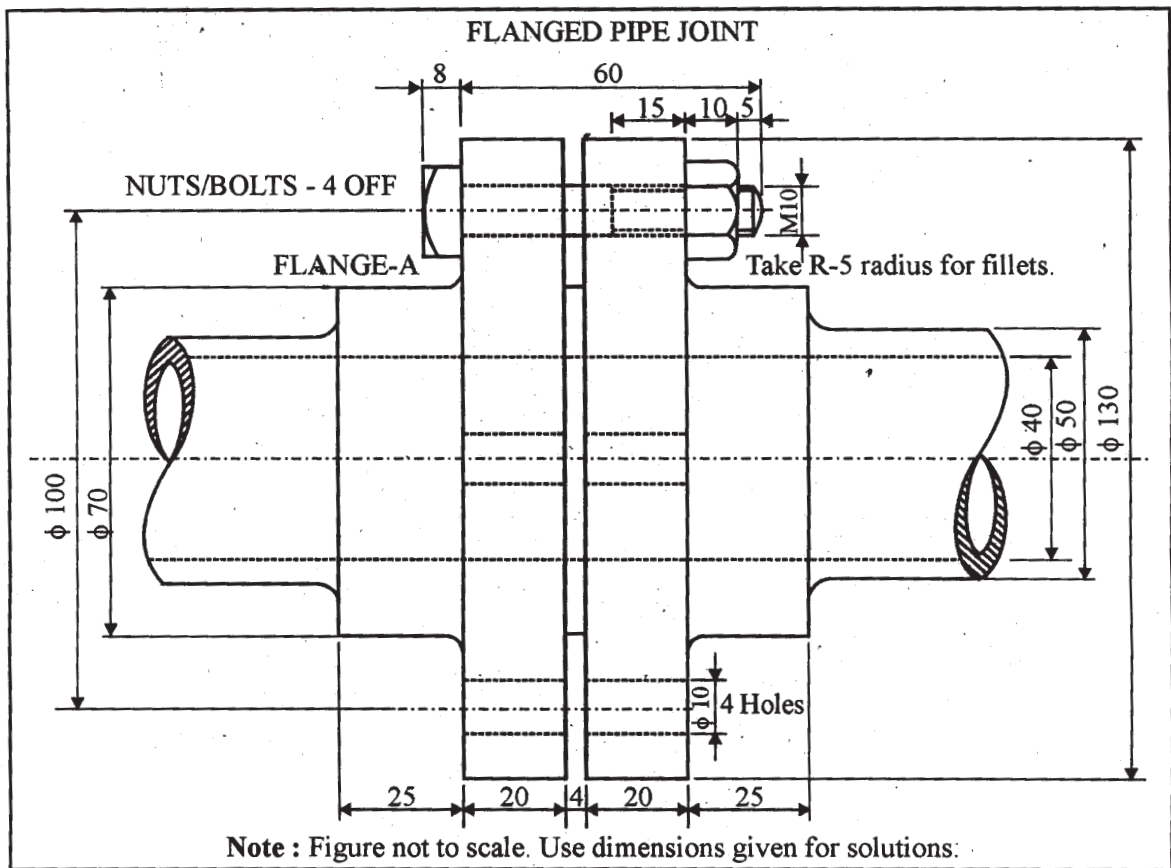
Figure 1

Fig. 2 shows, partly, the assembly of a flanged pipe joint. Disassemble the parts and then draw the following views, to scale 1 : 1. Keep the same position of the parts with respect to H.P. and V.P. :

(a) Front view of the flange A, showing the top half in section and side view, as seen from the left. 16

(b) Front view of any hexagonal nut and the side view, as seen from the right. 8  
 Print titles of both and scale used.

Draw the projection symbol. Give 8 important dimensions. 6



**Figure - 2**

**QUESTION PAPER CODE 68**

1. (a) Construct an isometric scale 80 mm long. 4
- (b) Construct the isometric projection, to isometric scale, of a hexagonal pyramid (base edge = 30 mm and height = 80 mm) keeping it in the inverted position. The axis is perpendicular to H.P. One base edge is perpendicular to V.P.

Draw the axis and indicate the direction of viewing. Give all dimensions. 7

- (c) A cylinder (diameter = 50 mm and height = 70 mm) is placed, centrally, with its circular end on the pentagonal face of a pentagonal prism (base edge = 40 mm and height = 30 mm). The common axis is perpendicular to H.P. The base of the prism is on H.P. and one of its base edges is parallel to V.P. and away from it.

Draw the isometric projection of the solids, placed together, to isometric scale. Draw the common axis and indicate the direction of viewing. Give all dimensions. 14

2. (a) Draw to scale 1:1 the standard profile of a B.S.W. thread, taking enlarged pitch = 50 mm. Give all standard dimensions. 9

**OR**

Draw the full sectional front view and top view of a single riveted lap joint. Take plate thickness = 9 mm. Give all standard dimensions. Use scale 1 : 1.

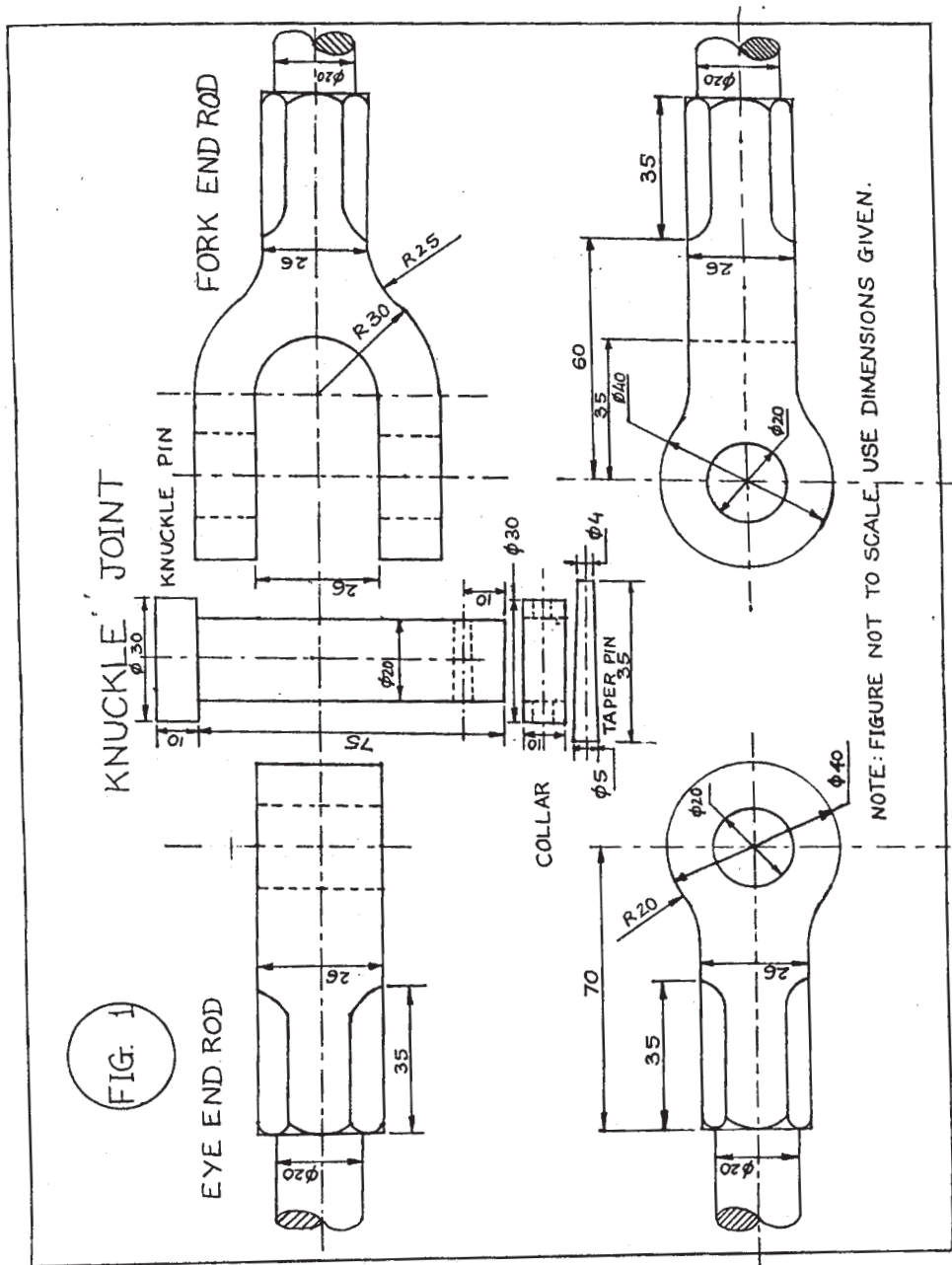
- (b) Sketch free-hand the front view and top view of a 90° flat counter sunk head screw of size M 20, keeping the axis vertical. Give all standard dimensions. 6

**OR**

Sketch free-hand the front view, top view and side view of a Woodruff key for a shaft of 60 mm diameter. Give all standard dimensions.

3. Figure 1, shows the details of a knuckle joint. Assemble the parts correctly and then draw, to scale 1 : 1, the front view, lower half in section. 24

Print title and scale used. Give 8 important dimensions. 6



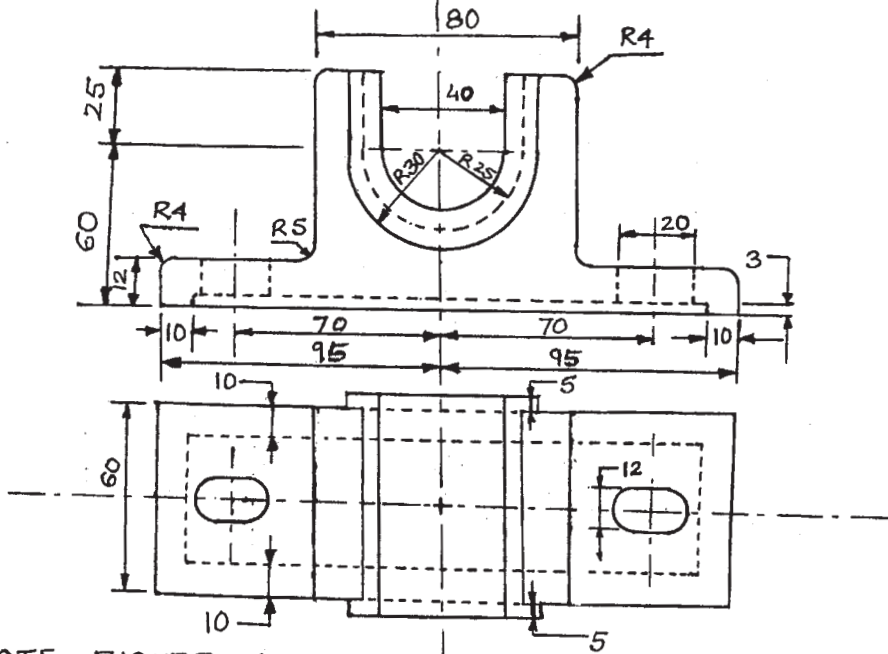
OR

Figure 2, shows the assembly of an open bearing. Disassemble the base and the bush and draw the following views to scale 1 : 1. Keep the same positions of the base and the bush with respect to H.P. and V.P.

- (a) Front view of the base, showing right half in section, and its top View. 16
- (b) Front view of the bush and full sectional side view, as seen from the left side. 8

Print titles of both and scale used. Draw the projection symbol. Give 8 important dimensions. 6

FIG 2 OPEN BEARING



NOTE: FIGURE NOT TO SCALE. USE DIMENSIONS GIVEN FOR SOLUTIONS.

## Marking Scheme — Engineering Drawing

### *Notes:*

- (i) Marks are to be awarded in proportion to the work done.
- (ii) Mistakes in dimensioning up to  $\pm 1.0$  mm may be ignored.
- (iii) In dimensioning, arrow-heads of various types, as per SP46-1988, are usable. However, where space is too small for an arrowhead, oblique stroke or a dot may be employed.
- (iv) In no view of questions '1' and in no sectioned view of question 3, are hidden edges/lines required.
- (v) Other standard methods of drawing/proportions for features like nuts, heads of bolts, screws etc., employed by examinees, may also be accepted.

**All Questions are to be answered correctly and accurately.**

QUESTION PAPER CODE 68/1

### EXPECTED ANSWERS/VALUE POINTS

<b>Q.1 ISOMETRIC SCALE</b>	<b>(4)</b>
(a) (i) Marking of divisions of 10 mm, 1 mm on true scale and marking angles of $30^\circ$ & $45^\circ$ .	1
(ii) Projections from scale 1:1 to get points on Isometric scale.	$\frac{1}{2}$
(iii) Construction of Isometric scale with main divisions of 10 mm each.	1
(iv) Division of the first part into 10 sub-divisions.	1
(v) Printing "Scale 1:1" and 'Isometric Scale'	$\frac{1}{2}$
<b>(b) ISOMETRIC PROJECTION OF AN INVERTED PENTAGONAL PYRAMID</b>	<b>(8)</b>
(i) Helping view (with isometric scale or scale 1:1) of pentagon with a side, parallel to V.P. and away from it.	1
(ii) Drawing isometric pentagon on top.	3
(iii) Drawing slant edges.	$1\frac{1}{2}$

- |      |   |   |
|------|---|---|
| (iv) | Marking the axis  | 1 |
| (v)  | Two dimensions, including that of axis through in-centers | 1 |
| (vi) | Direction of viewing                                      | ½ |

**Note:** For incorrect position of the pyramid, like using the 40mm sides of the pentagon for the base, 1 ½ marks should be deducted. If axis is drawn perpendicular to V.P. instead of drawing perpendicular to H.P., as asked, 1½ marks should be deducted. Also, in the helping view, if a side of pentagon is not taken parallel to V.P. and away from it, 1 mark (½ + ½) should be deducted.

**(c) CONE PLACED, CENTRALLY, ON A HEXAGONAL PRISM. (13)**

**(A) HEXAGONAL PRISM (7)**

- |       |   |   |
|-------|---|---|
| (i)   | Helping view of hexagon with a side perpendicular to V.P.         | 1 |
| (ii)  | Drawing isometric hexagons  | 3 |
| (iii) | Drawing face edges, parallel to vertical axis/V.P.                | 2 |
| (iv)  | Dimensioning the edge of the base and axis, i.e. height of prism. | 1 |

**(B) CONE AND DIRECTION OF VIEWING (6)**

- |       |   |    |
|-------|---|----|
| (i)   | Drawing elliptical curve for base           | 2½ |
| (ii)  | Drawing tangents to curves, i.e. generators | 1  |
| (iii) | Indicating the common axis of two solids    | 1  |
| (iv)  | Dimensioning of diameter and axis           | 1  |
| (v)   | Direction of viewing                        | ½  |

**Note:** For incorrectly placed solids, etc., proportionate deductions, as proposed in Q.1 (b) may be used.

**Q.2 (a) METRIC SCREW THREAD PROFILE (INTERNAL) (9)**

- |       |   |    |
|-------|---|----|
| (i)   | Distance, equal to pitch, marked correctly and angles of 60°, drawn correctly | 2  |
| (ii)  | Flat edges and curves for threads (minimum 2), drawn correctly                | 2½ |
| (iii) | Side edges (flanks), drawn correctly  | 1½ |
| (iv)  | Dimensioning  | 2  |

- (v) Neatness and line work 1

**OR**

**TEE BOLT (9)**

**FRONT VIEW**

- (i) Threaded and unthreaded portions of cylindrical shank, square neck and center line. 2½
- (ii) Head of bolt 1½

**TOP VIEW**

- (i) Circles of diameter 'd' and 0.85 d (thin and broken) 1
- (ii) Square neck and rest of the portion 1½

**Details:**

- (i) Dimensioning 1½
- (ii) Neatness and line work 1

**Note:** 3 marks may be deducted, in all, if sketched freehand, instead of drawing to scale 1:1.

**Q.2 (b) FOLLOWING COMPONENTS ARE TO BE SKETCHED FREEHAND PROPORTIONATELY:**

**GRUB SCREW (SIZE M25) (6)**

- (i) Front view with its axis, perpendicular to H.P. 3
- (ii) Top view 2
- (iii) Dimensions 1

**OR**

**PAN HEAD RIVET (for a diameter of rivet of 25 mm) (6)**

**FRONT VIEW**

- (i) Sketching the head with correct proportions. 2½
- (ii) Sketching cylindrical portion, broken end and hatching 1½



## TOP VIEW

- (i) Two circles 1
- (ii) Dimensioning 1

**Note:** 2 marks may be deducted, if these components are drawn with instruments, instead of being sketched freehand.

### Q.3 PLUMMER BLOCK (Assembly) (30)

#### (A) FRONT VIEW, RIGHT HALF IN SECTION (15)

##### (i) Base:

- (a) Right half in section with two holes with their axes. 4½
- (b) Left half, without section, with properly located axes for holes. 2½

##### (ii) Brasses (Upper & lower):

- (a) Drawn in correct position with right half in section alongwith oil hole and snug. 3
- (b) Left half without section 2

##### (iii) Cap:

- (a) Right half in section with holes for bolt and oil. 3
- (b) Left half without section. 1½

##### (iv) Square headed bolts:

- (a) Full bolt on the right. 3
- (b) End of bolt, coming out of nut, on the left, alongwith shank between the base and the cap. 1½

##### (v) Hexagonal nuts: One nut, placed properly, on each side 3

#### (B) DETAILS:- (6)

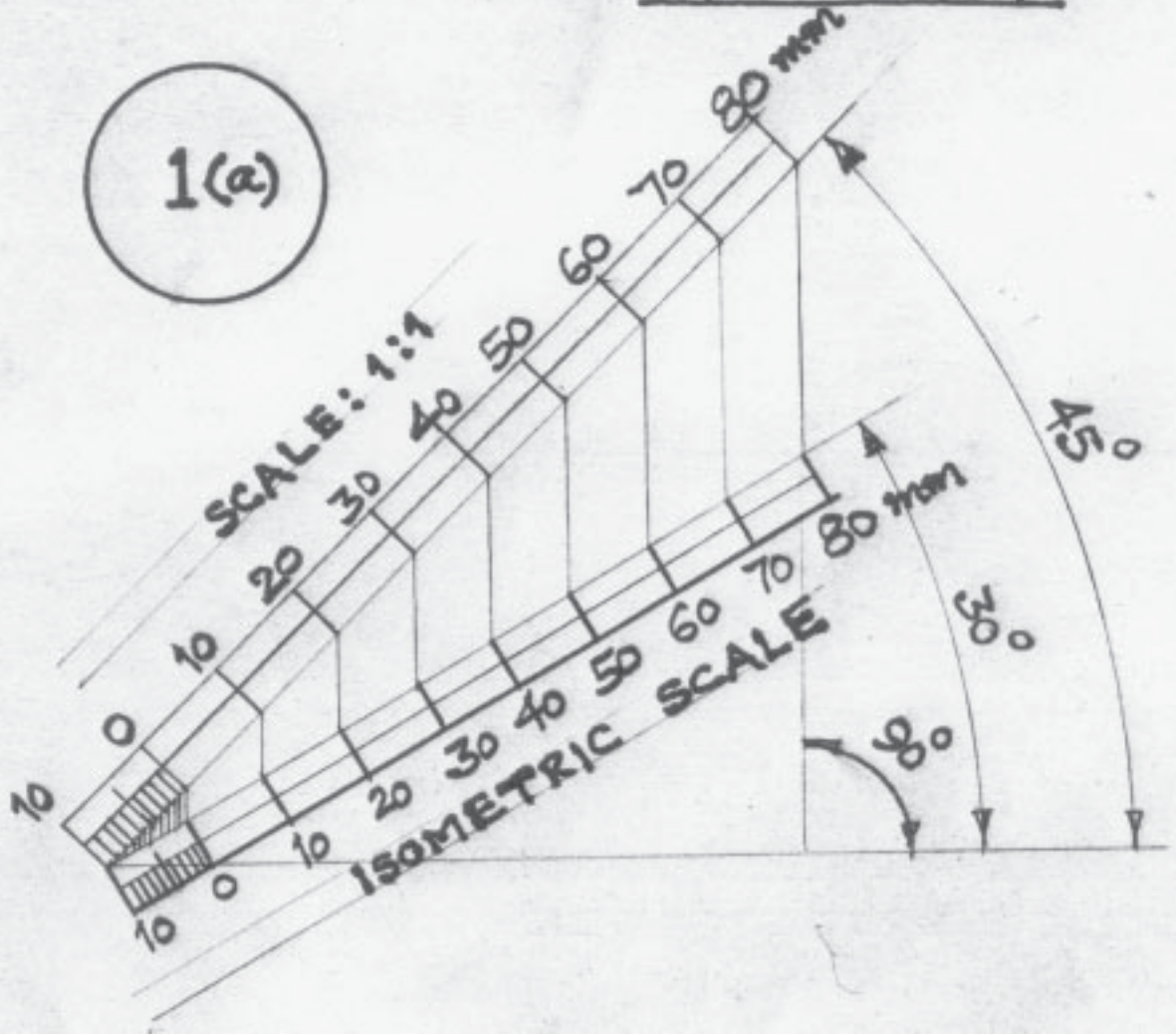
- (i) Neatness and line work. 2
- (ii) Printing title and scale used 2
- (iii) Showing 8 dimensions 2

OR

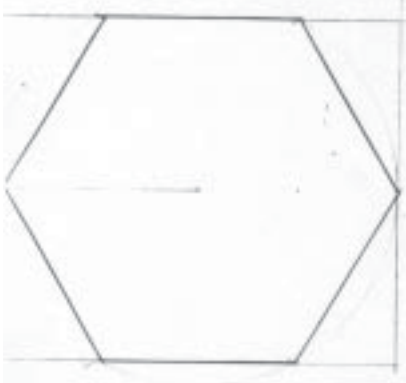
<b>FLANGED PIPE JOINT (Dis-assembly)</b>	<b>(30)</b>
<b>(A) FLANGE A</b>	<b>(16)</b>
<b>FRONT VIEW, TOP HALF IN SECTION</b>	
(i) Boundary with conventional representation of end of pipe	3½
(ii) Properly located axes of pipe and two holes for bolts	1½
(iii) Line indicating inner radius of pipe, hatching lines and holes	3
(iv) Remaining two vertical lines in lower half	1
<b>SIDE VIEW, AS SEEN FROM THE LEFT</b>	
(i) Four circles, axes and the hatching lines	3
(ii) Drawing four holes for bolts and the pitch circle	2½
(iii) Drawing cutting plane XX' for the front view	½
(iv) Neatness and line work	1
<b>(B) HEXAGONAL NUT</b>	
<b>FRONT VIEW</b>	<b>(8)</b>
(i) Drawing horizontal axis, one vertical line for base of nut and four horizontal lines	1½
(ii) Drawing curves for chamfer of nut, the associated vertical line and chamfer lines	2
<b>SIDE VIEW, AS SEEN FROM THE RIGHT</b>	
(i) Drawing the chamfer circle, two circles – one broken and other full and the circumscribing hexagon.	3
(ii) Drawing the horizontal and the vertical axis.	½
(iii) Neatness and line work	1
<b>DETAILS</b>	<b>(6)</b>
(i) Printing titles	2
(ii) Projection symbol	1
(iii) Scale used	1
(iv) Dimensioning	2

Paper Code: 68/1

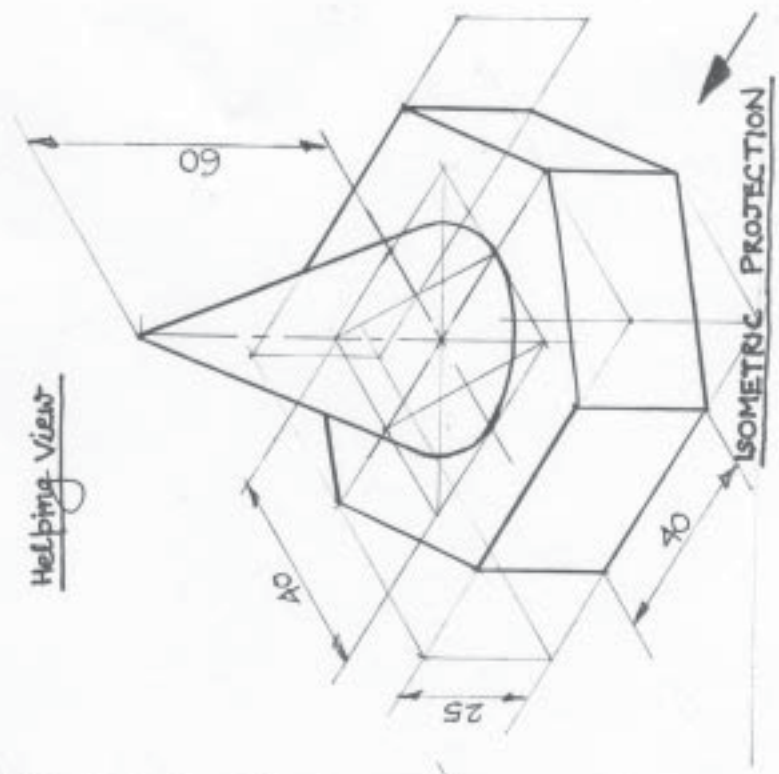
1(a)



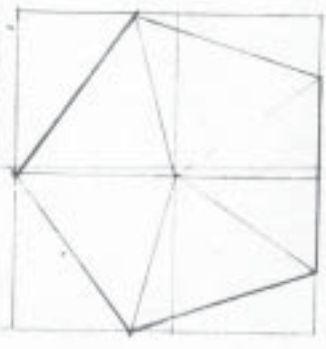
Paper Code: 68/1



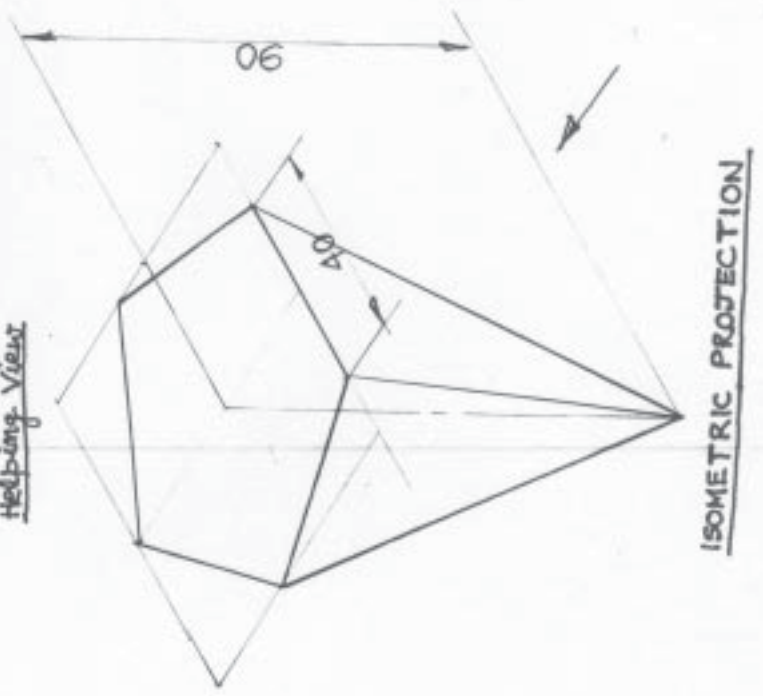
Helping View



Paper Code: 68/1



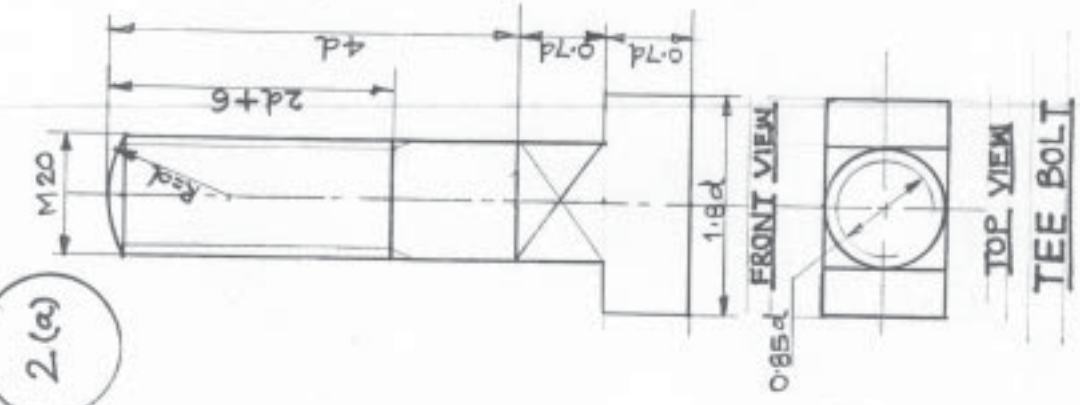
Helping View



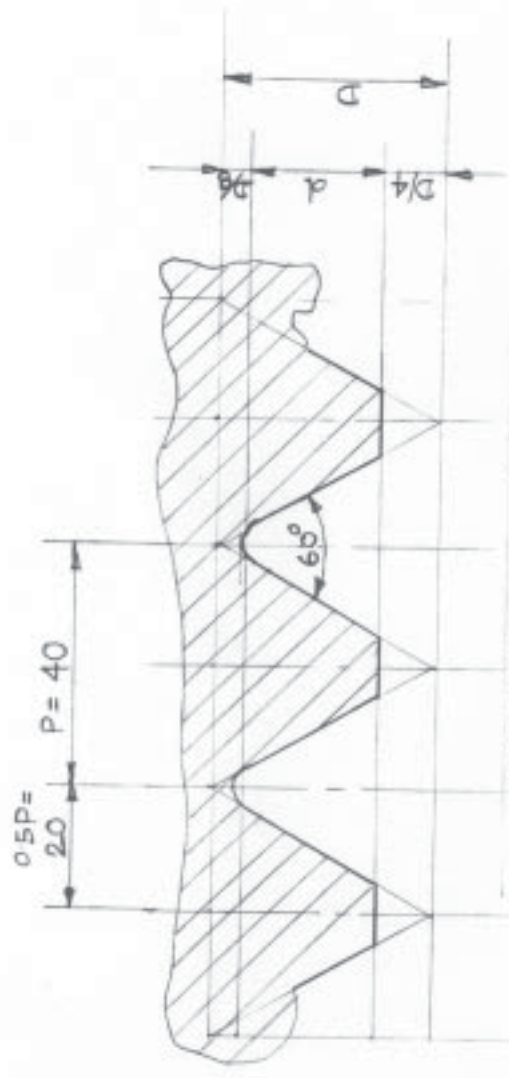
1(c)

1(b)

2(a)

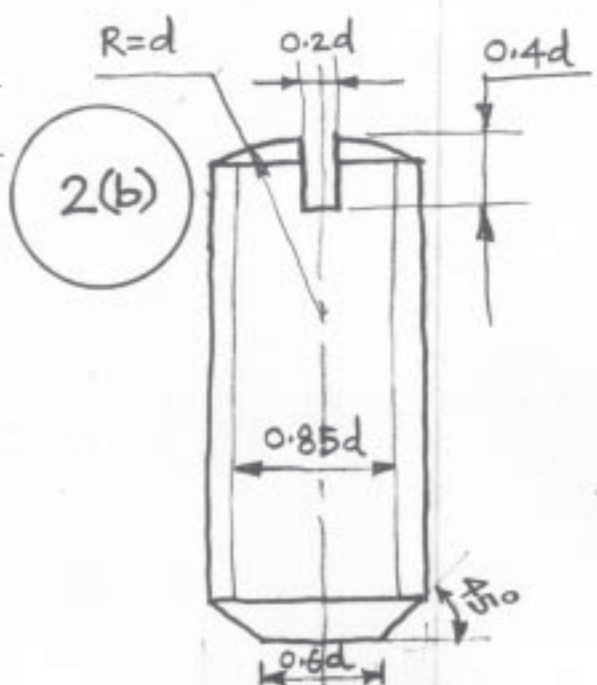


d	20
	14
	36
	46



METRIC THREAD (INTERNAL)

P	D	d
40	$0.86P$	$0.54P$



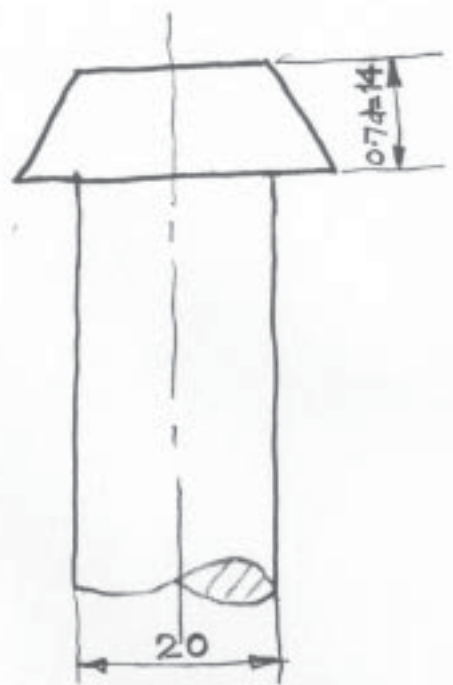
2(b)

M 25 FRONT VIEW  
(d=25)

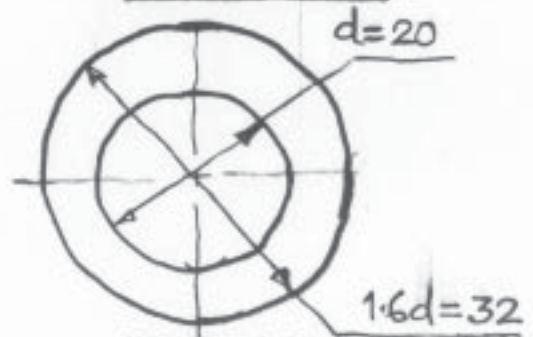


TOP VIEW

GRUB SCREW

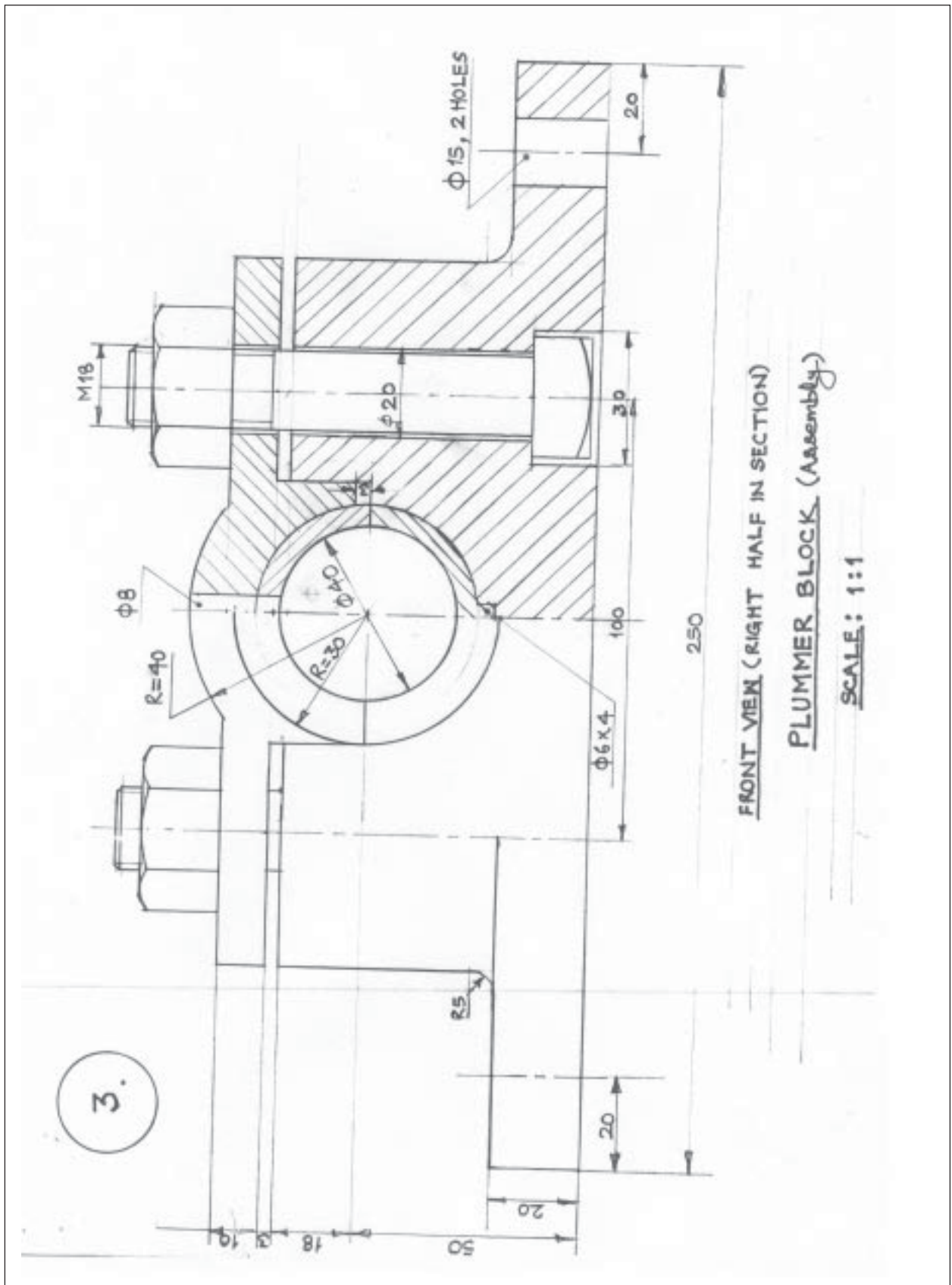


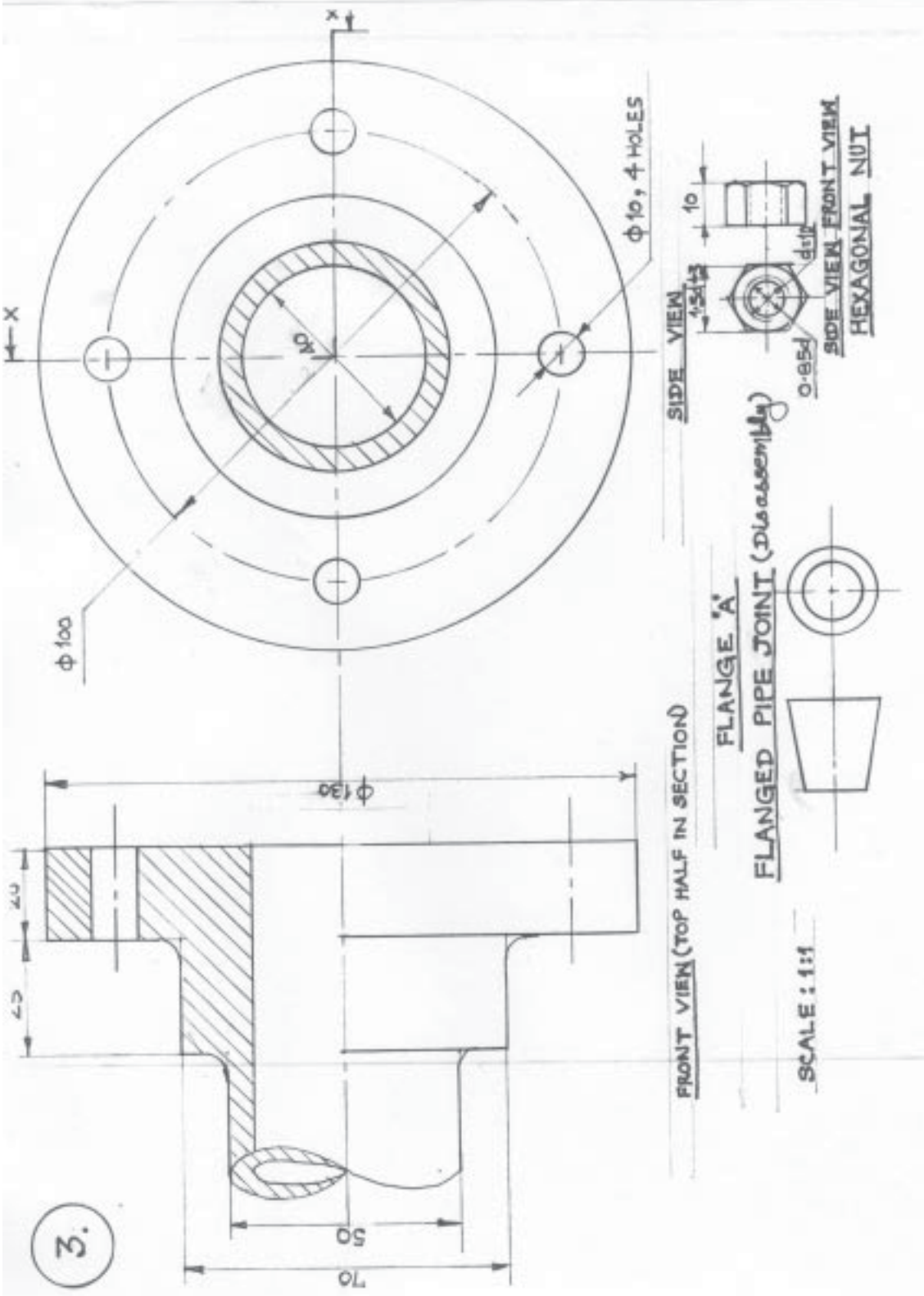
FRONT VIEW



TOP VIEW

PAN HEAD RIVET







QUESTION PAPER CODE 68

EXPECTED ANSWERS/VALUE POINTS

- Q.1 (a) ISOMETRIC SCALE (4)**
- (i) Marking of divisions of 10 mm, 1 mm on true scale and marking angles of 30° & 45°. 1
  - (ii) Projections from scale 1:1 to get points on Isometric scale. ½
  - (iii) Construction of Isometric scale with main divisions of 10 mm each. 1
  - (iv) Division of the first part into 10 sub-divisions. 1
  - (v) Printing “Scale 1:1” and ‘Isometric Scale’ ½
- (b) ISOMETRIC PROJECTION OF AN INVERTED HEXAGONAL PYRAMID (7)**
- (i) Helping view(with isometric scale or scale 1:1) of hexagon with a side, perpendicular to V.P. 1
  - (ii) Drawing isometric hexagon on top 2 ½
  - (iii) Drawing slant edges 1 ½
  - (iv) Marking the axis and direction of viewing 1
  - (v) Two dimensions, including that axis through in-centres 1
- Note:-** For incorrect position of the pyramid, like using the 30mm sides of the hexagon for the base , 1½ marks should be deducted if axis is drawn perpendicular to V.P., instead of drawing perpendicular to H.P., as asked , 1½ should be deducted, Also, in the helping view, if a side of hexagon is not taken perpendicular to V.P., as asked, 1 mark should be deducted.
- (c) CYLINDER, PLACED, CENTRALLY, ON PENTAGONAL PRISM: (14)**
- PENTAGONAL PRISM:**
- (i) Helping view (with isometric scale or scale 1:1) of pentagon with a side, parallel to V.P. and away from it. 1
  - (ii) Drawing isometric pentagons at the top and bottom 3
  - (iii) Drawing face edges parallel to axis. 1½
  - (iv) Dimensioning (base side and height) 1

**CYLINDER:-**

- |       |   |    |
|-------|---|----|
| (i)   | Correct central placement and drawing common vertical axis. | 1½ |
| (ii)  | Drawing ellipses for top and base.                          | 3  |
| (iii) | Drawing to tangents to ellipses                             | 1  |
| (iv)  | Dimensioning diameter and axis through in —centres          | 1  |
| (v)   | Neatness and line work                                      | 1  |

**Note:** For incorrectly placed solids etc. proportionate deductions, as proposed in Q.1 (b) may be used.

**Q.2 (a) B.S.W . THREAD PROFILE (9)**

- |       |   |   |
|-------|---|---|
| (i)   | Distances, equal to pitch, marked correctly and angles 55° drawn correctly. | 2 |
| (ii)  | Curves for threads ( minimum 2 curves at the top and bottom )               | 2 |
| (iii) | Side edges ( flanks) , tangential to the curves                             | 2 |
| (iv)  | Dimensioning  | 2 |
| (v)   | Neatness and line work  | 1 |

**OR**

**SINGLE RIVETED LAP JOINT (9)**

**SECTIONAL FRONT VIEW**

- |      |                           |   |
|------|---------------------------|---|
| (i)  | Plates with hatching line | 2 |
| (ii) | Rivet with both head      | 2 |

**TOP VIEW**

- |       |  |   |
|-------|--|---|
| (i)   | Two plates correctly positioned.   | 1 |
| (ii)  | Rivet heads (minimum 2) with correct pitch length and their axes along with Cutting plane line | 2 |
| (iii) | Dimensioning, neatness and line work.  | 2 |

**Note:** 3 marks may be deducted, in all, if sketched freehand, Instead of drawings to scale 1:1

<b>Q.2 (b) <u>90° FLAT COUNTER SUNK HEAD SCREW</u></b>	<b>(6)</b>
(i) Sketching front view with its axis, perpendicular to HP	3
(ii) Sketching top view.	2
(iii) Dimensioning	1

**OR**

**WOOD RUFF KEY**

(i) In front view, keeping horizontal edge at 0.25 t below the centre	1
(ii) Drawing the horizontal edge and curve with a radius of $R = 2t$	2
(iii) Drawing side view	1
(iv) Drawing top view	1
(v) Dimensioning	1

**Note:** 2 marks may be deducted if these components are drawn with instruments, instead of being sketched free hand.

**Q.3 KNUCKLE JOINT (Assembly):** **(30)**

**FRONT VIEW, LOWER HALF IN SECTION:** **(24)**

(i) Fork (complete), with lower half in section.	9
(ii) Single eye end (complete), with lower half in section, positioned correctly	5
(iii) Knuckle pin (fitted) and positioned correctly.	3
(iv) Collar, positioned correctly, with hatching lines.	2
(v) Taper pin, positioned correctly.	3
(vi) Neatness and line work.	2

Printing title (1), scale used (1) and eight dimensions (4) **(6)**

**(OR)**

**OPEN BEARING (Disassembly)** **(30)**

**(A) BASE:** **(16)**

**FRONT VIEW, RIGHT HALF IN SECTION**

(i) Full boundary of base along with properly located axes (four in all) and all the fillets and rounds.	6
--	---

- |      |  |   |
|------|--|---|
| (ii) | For right half – sectioned portion of the base, hatching lines, hole and base – recess | 3 |
|------|--|---|

**TOP VIEW**

- |       |   |    |
|-------|---|----|
| (i)   | Complete boundary with four vertical lines and dotted rectangle (indicating recess) | 3½ |
| (ii)  | Two bolt holes and cutting plane lines  | 2½ |
| (iii) | Neatness and line work.   | 1  |

**BUSH** **(8)**

**FRONT VIEW**

- |      |   |    |
|------|---|----|
| (i)  | Six vertical lines                        | 1½ |
| (ii) | Three semi circles and cutting plane line | 2  |

**SIDE VIEW (FULL IN SECTION)**

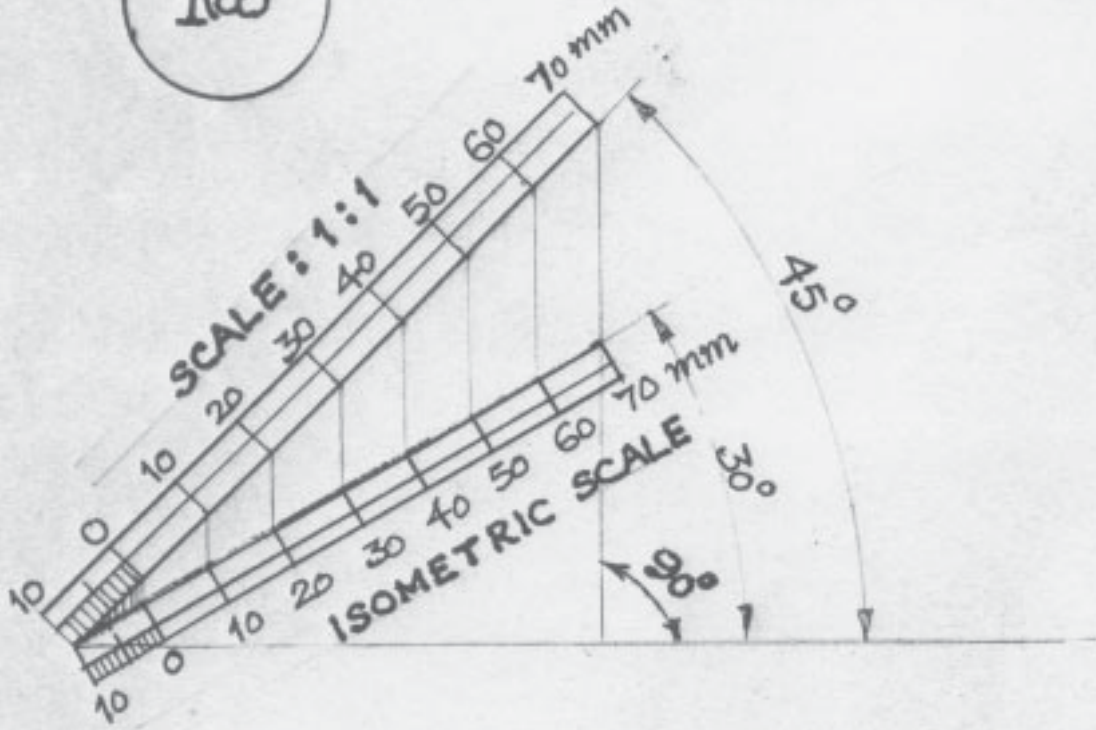
- |       |   |    |
|-------|---|----|
| (i)   | Drawing entire boundary                               | 2  |
| (ii)  | Horizontal dark line for R20, axis and hatching lines | 1½ |
| (iii) | Neatness and line work                                | 1  |

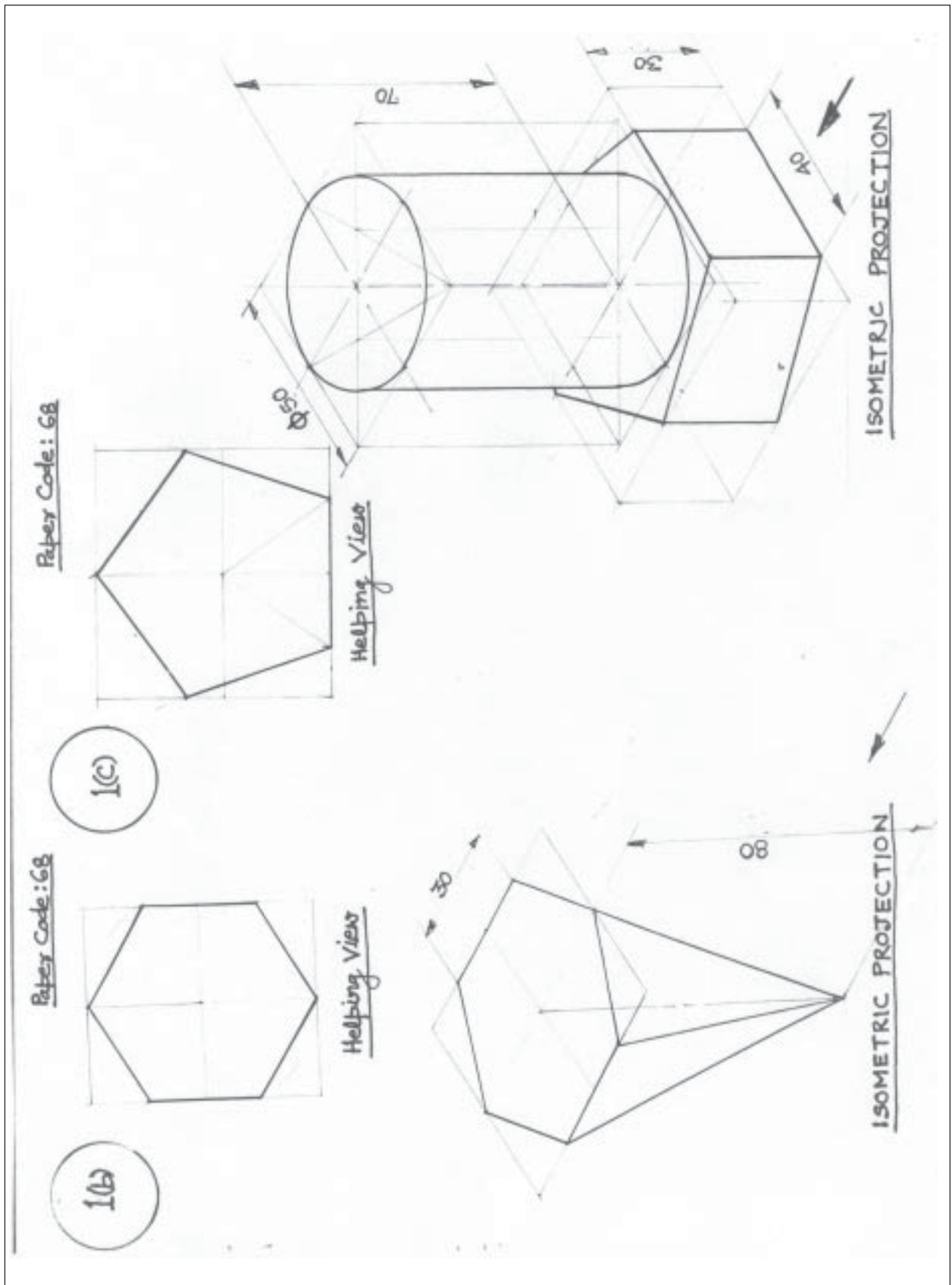
**DETAILS** **(6)**

Titles of both (2), scale used (1), projection symbol (1) and eight dimensions (2)

1(a)

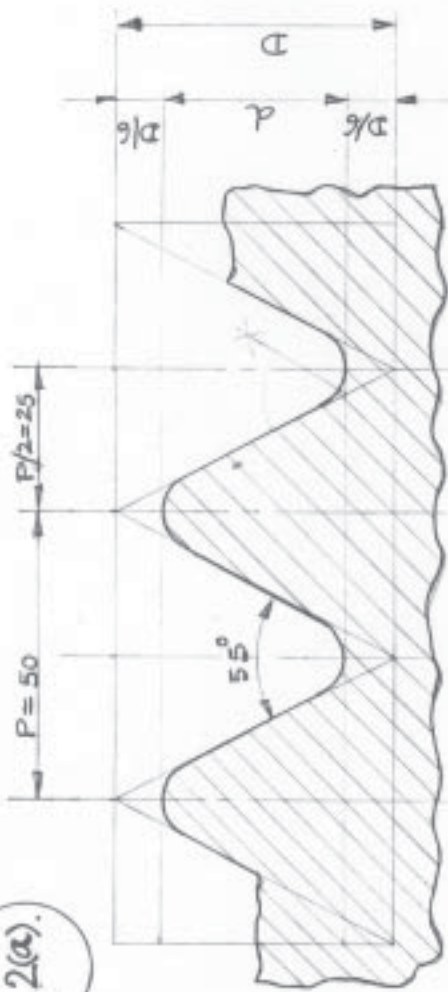
Paper Code: 68.





Paper Code: 68

2(a)

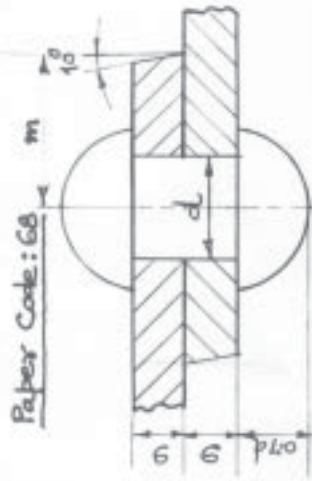


B.S.W. THREAD

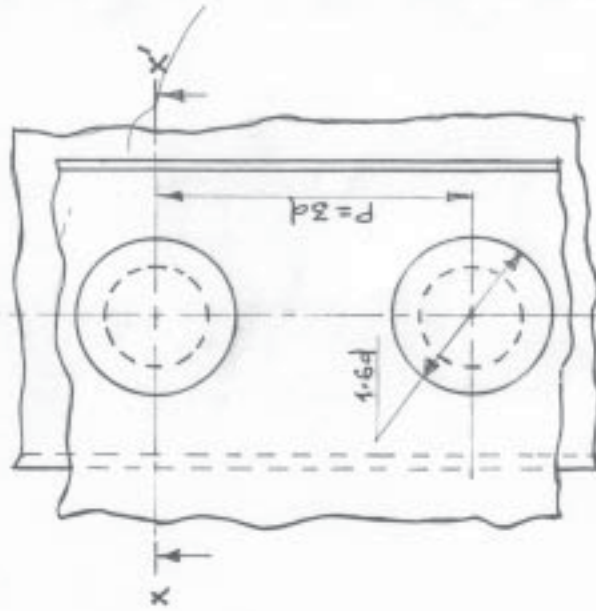
D	d
0.96P	0.67P

$d = \frac{5}{16}P$	18
0.7d	12.6
1.6d	28.8
P	54
max d	27

Paper Code: 68

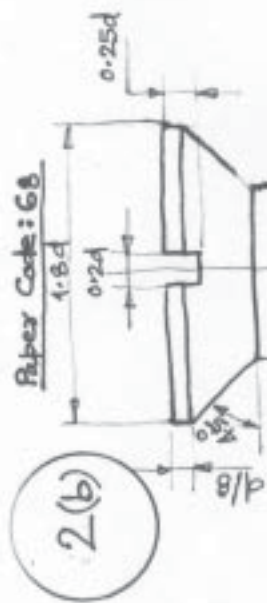


FRONT VIEW (section at x-x)

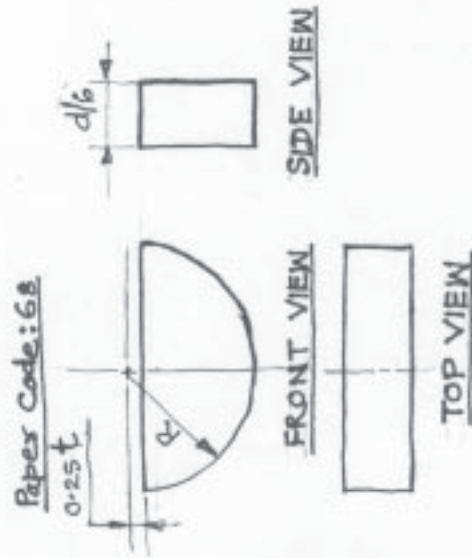


TOP VIEW

SINGLE RIVETED LAP JOINT



d	20
0.2d	4
0.25d	5
d/8	2.5
0.85d	17
1.8d	36



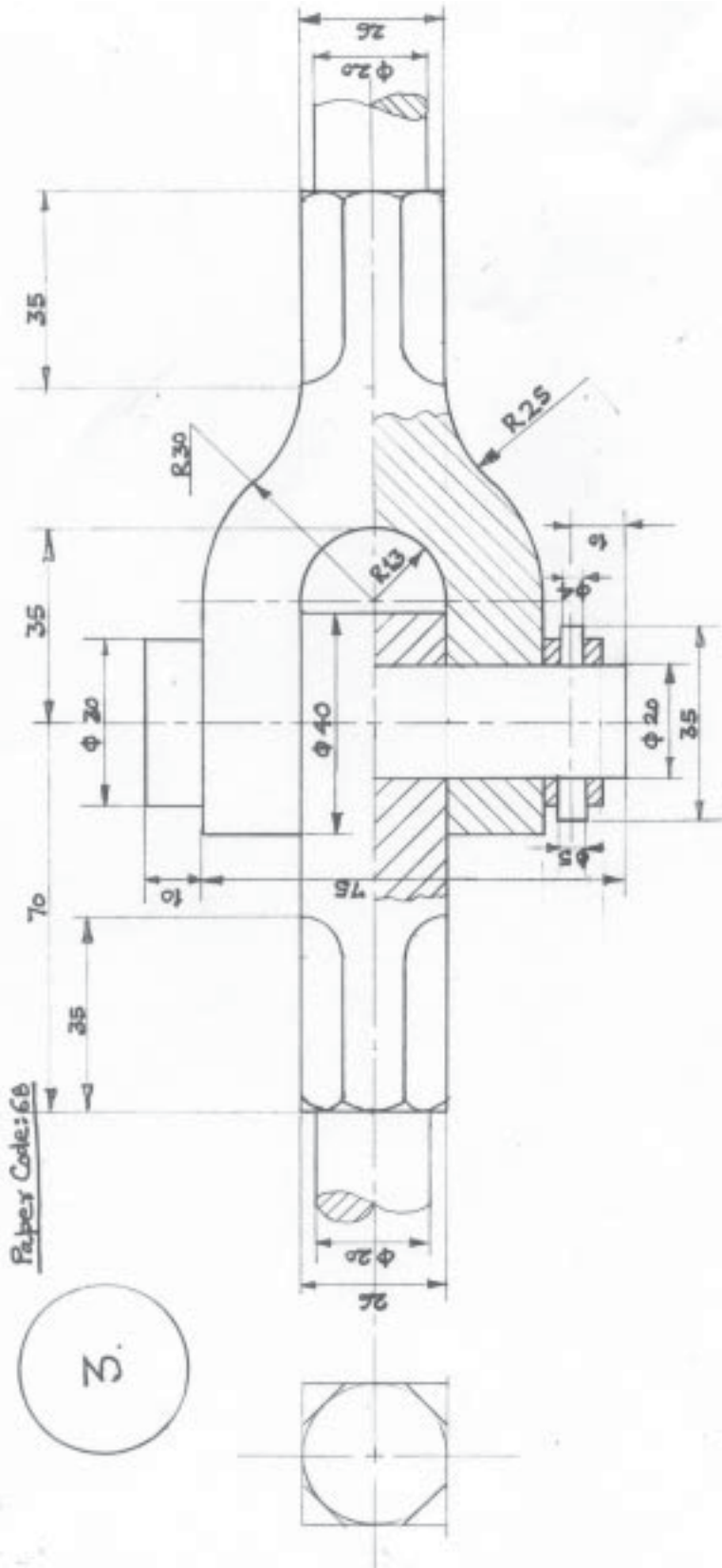
WOODRUFF KEY

d	$t = \frac{d}{6}$	0.25t	R=2t
60	10	2.5	20



90° FLAT COUNTER SUNK HEAD SCREW





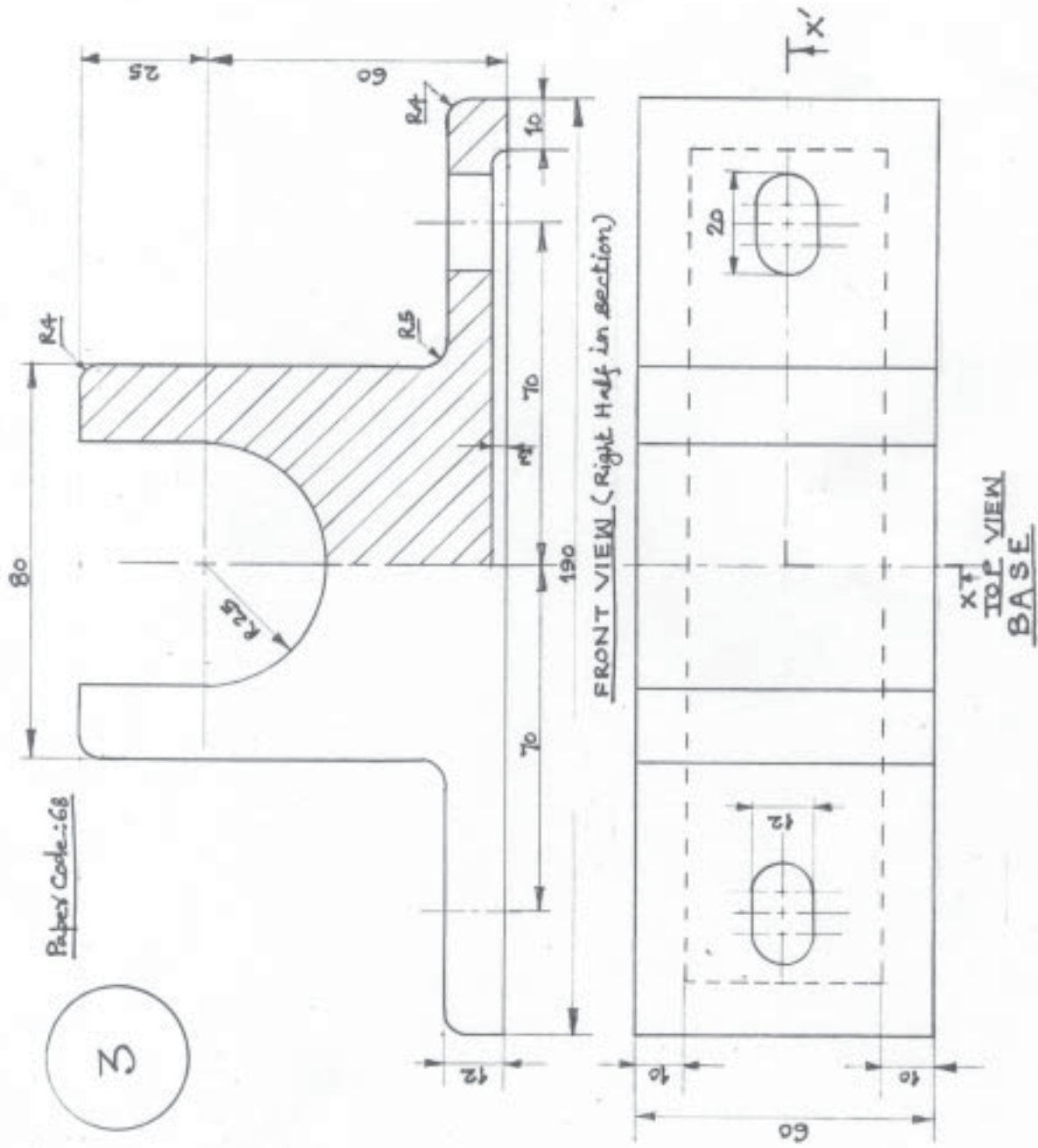
FRONT VIEW (Lower Half in section)

KNUCKLE JOINT

SCALE: 1:1

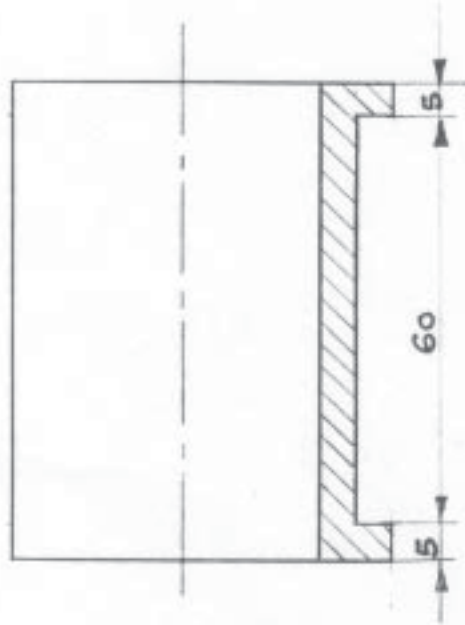
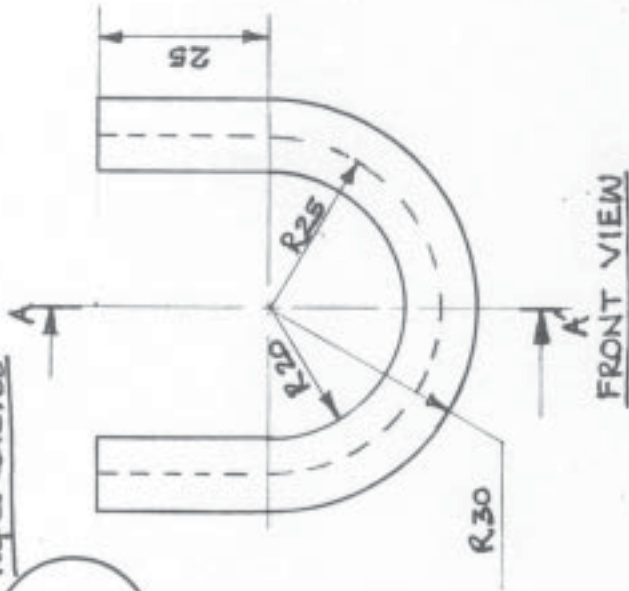
3

Paper Code: 68



Paper Code: 68

3



BUSH

OPEN BEARING

SCALE: 1:1

