


c)  ವ್ಯಕ್ತಿಯ ವಲಯಲಕ್ಷಣಗಳು ಅಖರಿಸಿರುವ ಪ್ರತಿಪಾದಿಸಿ.

c)  ರೈತರಾತ್ಮಕ ಸಂಪತ್ತು ಅತಿ ಬಹುಮಟ್ಟಿನಲ್ಲಿ ಅವಷ್ಯಕವಾದ ಪ್ರಯೋಗದಲ್ಲಿ ಸರಿಸೀಮಿತ ಸಹಾಯ ಮಾಡಲಾಗದು.

c)  ಸಿದ್ದಿ ದೊಡ್ಡತೆಯಲ್ಲಿ ಆಧಾರ ಅಭಿವೃದ್ಧಿಯಲ್ಲಿ ಮಹತ್ವ.


d)  ಮಿಶ್ರಾಯ ಆರಾರು ಮಾಡಲು.

d)  ಸಿದ್ದಿ ದೊಡ್ಡತೆಯಲ್ಲಿ ಮಾಡಲು.

d)  ಮಿಶ್ರಾಯಗಳಿಗೆ ದೊಡ್ಡತೆಯಲ್ಲಿ ಮಾಡಲು.

d)  ಬಂಡು ಸಂಪತ್ತು ಪರಿಸ್ಥಿತಿಗಳಲ್ಲಿ.

d)  ಸಮಿತಿಗಳಿಗೆ ಸರಿಸೀಮಿತ.
3. ನಂತರ ಮರಣಮಾಡಿಸಿದ್ದೆಂದರೆ ರಕ್ಷಣೆಯಲ್ಲಿ ಅವಕಾಶ ತೊಡಗಿಸಿದ್ದು ಮೂಲದಲ್ಲಿಯೇ ನಡೆಯುತ್ತಾನೆ: (5×1=5)
   ಅ) ಜೀವಾಣಿಯ ಬ) ನಂತರ
   ಹ) ಹೊಸ ಮ) ನಂತರ
   ಗ) ಹೊಸ ನ) ತೊಡಗಿಸಿ
   ಣ) ತೊಡಗಿಸಿ ಬ) ಅವಕಾಶ
   ಫ) ಸುಪ್ರಸಿದ್ಧ

4. ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಸಂಶಯಗಾರಿಸಿ ಹಿಡಿಸಿದ್ದರು ಎಂದು ಸೂಚಿಸಿರುತ್ತಾನೆ. (5×1=5)
   ಸುತ್ತ ಸಂಶಯದನ್ನು ಎದುರುತ್ತಾರೆ ಎಂದು ಸೂಟ್ಟದಲ್ಲಿ ಸೂಚಿಸಿದ್ದರು. ಅದರ ಪ್ರಕಾರ ಇತರರ ಅವಕಾಶದ ಅಗತ್ಯವಿದೆ. ಸಂಶಯದ ಗಳನ್ನು ಕಾಣುವುದು ಲೇಗುವುದು ಸೂಟ್ಟದಲ್ಲಿ ಸೂಚಿಸಿದರು. ಅದರ ಪ್ರಕಾರ ಇತರರ ಅವಕಾಶದ ಅಗತ್ಯವಿದೆ. ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಸಂಶಯದ ಲೇಗುವುದಿಲ್ಲದು. ಅದರ ಪ್ರಕಾರ ಇತರರ ಅವಕಾಶದ ಅಗತ್ಯವಿದೆ.
   ಅ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?
   ಬ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?
   ಹ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?
   ಣ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?
   ಫ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?

ಮುಖ್- 2

5. ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಮರಣದ ಸಾಮರ್ಥ್ಯ ಸರಸ 250-300 ಮತ್ತು ಅಪಾರ ಸುಪ್ರಸಿದ್ಧಿಯೇ ಸೂಟ್ಟದಲ್ಲಿಯೇ: (1×15=15)
   ಅ) ಸಂಶಯದ ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು?
   ಬ) ಸಂಶಯದ ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?
   ಮ) ಸಂಶಯದ ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?
   ಜ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಅಚ್ಚಿದ್ದು ಸೂಟ್ಟದಲ್ಲಿ?

6. ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಮರಣಮಾಡಿಸಿದ್ದೆಂದರೆ ಸೂಟ್ಟದಲ್ಲಿಯೇ ಸುಪ್ರಸಿದ್ಧಿಯೇ: (5×2=10)
   ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ ಮರಣಮಾಡಿಸಿದ್ದೆಂದರೆ ಸೂಟ್ಟದಲ್ಲಿಯೇ?
   ಅ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ?
   ಭ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ?
   ರ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ?
   ಲ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ?
   ನ) ಹಿರಿಯಾಗಿದ್ದೆಂದರೆ?
7. ಇದು ಹೊಂದಿದ್ದು ಅರ್ಥವಿದ್ದು ಹುಲ್ಲುವಿದ್ದು ಸೋಷಿತವಿದ್ದು ಮತ್ತು ಸೇವೆಯ ಸೂಚಿಸಿದ್ದು.

(1×15=15)

8. ಈ ವಿಷಯದಲ್ಲಿ ಬರೆದುವಂತಹ ವ್ಯಕ್ತಿ ವ್ಯಕ್ತಿಯನ್ನು ತನ್ನ ಮತ್ತು ಅಂಗಗಳು ಸೂಚಿಸಿದ್ದು.

(5×3=15)

9. ಈ ವಿಷಯವನ್ನು ಸೂಚಿಸಿದ್ದಾಗ ವ್ಯಕ್ತಿಯನ್ನು ಕೂಡಾ ಮತ್ತು ಅಂಗಗಳು ಸೂಚಿಸಿದ್ದು.

(1×15=15)
Duration : 3 Hours  Max. Marks : 100

Instructions : 1) Answers should be written in English only.
2) Answer all the questions.
3) Marks are indicated against each question.
4) Write the PRÉCIS on the sheet provided.
5) Write the question number and sub-question number correctly.

PART – A

1. Fill in the blanks with appropriate forms of the verbs given below: (7×1=7)
   (begin, know, beat, lose, build, cost, leave)
   A) The train __________ an hour ago.
   B) England __________ by India in the Mumbai cricket in 2006.
   C) We have __________ to suffer from malnutrition.
   D) Had I __________ that you would be late, I’d have finished my lunch.
   E) My new watch has __________ me Rs. 900.
   F) Our company __________ an opportunity to win a tender last week.
   G) Have you __________ the house on a disputed land?

2. Each of the following sentences requires an article (A/AN/THE) at the appropriate place. Rewrite the sentences using the required article in the right position: (3×1=3)
   A) Each of us has role to play.
   B) Are you best singer of the year?
   C) Inspiring leader will always be remembered.

3. In the following sentences, key words have been omitted from the idiomatic expressions. Fill in the blanks to complete the idioms: (3×1=3)
   A) The disobedient son turned a ________________ ear to his father’s advice.
   B) The newly-wed couple left for their honeymoon with a ________________ in their heart.
   C) The unemployed youth could not make both ________________ meet.

P.T.O.
4. Complete the following sentences with appropriate prepositions chosen from the list in brackets. (5×1=5)

A) Hundreds of visitors pour ____________ the city.
(by, into, against, for)

B) She had been treasurer ________________ three terms.
(with, to, for, of)

C) It’s a long journey ________________ the hills to the plains.
(from, since, between, at)

D) An extra pair of eyes can be a boon ________________ insects.
(under, on, through, to)

E) Was there any interaction ________________ the speaker and the audience?
(between, in, across, above)

5. Correct the following sentences and rewrite the corrected versions: (7×1=7)

A) The surface of these products are smooth.

B) Let us discuss about your plans.

C) Gopi and myself will handle the job.

D) Did you buy new equipments for your factory?

E) The cashier dispersed salary to the workers.

F) Of the six possible locations, Karwar is the better one.

G) The two company’s were in competition.

PART - B

6. Rewrite as directed: (5×1=5)

A) A ________________ (perquisite/prerequisite) enjoyed by MPs is free accommodation.
(choose the correct word)

B) The once a year elections are to be held tomorrow.
(Replace the underlined words by a single word)

C) We were ________________ (abroad/aboard) the plane 20 minutes before the departure.
(Choose the correct word)
D) From the following list of words, choose the word opposite in meaning to the remaining words:
(careless, negligent, observant, inattentive)

E) We should be indebted to the school where we studied.
[The underlined words can be substituted by
(a) bonafide  (b) alumni  (c) almamater  (d) magnum opus]

7. Read the following passage and answer the questions given below as directed: (5x1=5)

We may have been taught that butterflies are lovely and toads are ugly; so, we admire the butterfly and shrink away from the toad without really examining it to find out if what we had been taught is true. Or, we are taught that flowers are good and weeds are bad; so, we pull up the latter without a glance. To the artist’s eye there is no good or bad. There is just the inappropriate. In the garden, weeds are not appropriate, but in the vacant lot they offer a world of enchantment. And after we have learned to see the beauty in weeds, even though we have to pull them out of the garden, we can first admire their design.

A) What have we been taught about butterflies and flowers?

B) In the garden, weeds offer a world of enchantment. (True/False)

C) To the artist, there is only the ________________ or the ________________
   a) good; bad
   b) lovely; ugly
   c) appropriate; inappropriate
   d) fear; admiration.

D) In the sentence “... so, we pull up the latter without a glance”, what does “latter” stand for?

E) The message conveyed by the above passage is that we should
   a) avoid preconceived ideas.
   b) disregard what is lovely and beautiful.
   c) not admire toads and weeds.
   d) not trust our teachers.
8. A) Write a PRÉCIS of the following passage in about 90 words. State the number of words in your précis. Use the sheets provided and secure them to the answer book. Suggest a suitable title.

Business communication is about getting your message across clearly and in a professional manner. Writing letters and sending them by e-mail is no different. But people, who are normally competent and confident letter writers somehow find themselves hesitant when it comes to business e-mail. This is probably because it is very hard to find the right tone – it is too easy to drop into the casual conversational mode. Write e-mail letters as you would write a normal business letter. E-mail may be global but it has not yet broken down international business etiquette barriers, so start formally with ‘Dear Mr. X’ which is much better than ‘Hi there!’ Correct spelling and good grammar are essential – jokes and chatroom shorthand are out.

Doing business by e-mail can be a bit impersonal – you need to know your reader exists in the real world! Making contact by phone as well is a good way to build your relationship. Reply to e-mails promptly. A swift ‘I’ll get back to you’ is better than silence.

Add confidentiality or security notices to your e-mails; if you are not sure who may read them – be safe rather than sorry. Do not send large attachment; ‘snail mail’ may be better if there is time.

You can place orders, present proposals and finalise contracts via e-mail, but anything requiring a signature will still need a letter, fax or face-to-face meeting.

E-mail is instantaneous; it is intensive. Nevertheless, it is not necessary to abandon the letter writing rules that we follow in business communication. (271 Words)

B) Answer any one of the following:

Write a letter to your friend about your recent trip to a historic place in Karnataka.

OR

Write a letter of complaint to the authorities concerned regarding the opening of a bar-cum-restaurant in your locality.

C) Write an essay on any one of the following topics in about 300 words:

a) Global warming: causes and remedies.

b) Imaginary meeting with an icon (dead or living) – scientists/actors/politicians may be considered.

c) “Reading is to the mind what exercise is to the body” – Comment.
CIVIL ENGINEERING

Duration: 3 Hours

Max. Marks: 100

INSTRUCTIONS

1) Answer all questions.
2) Answers to be written in English only.
3) Additional data required may be assumed suitably and mentioned clearly.
4) IS Codes, Handbooks and Charts are Not Allowed.
5) Part A contains Three questions and Part B contains Four questions.
6) Candidates are permitted to use their own simple scientific non-programmable type calculator.

PART – A
(Each Sub-question carries one mark)

Question No: 1 Marks: 7×1=7

1. Fill in the blanks:

A) If two equal and opposite forces are keeping a rigid body under equilibrium they must be _______________________

B) Gypsum is added to ordinary Portland cement at the time of its manufacture for the purpose of ______________________

C) Presence of organic material in water is indicated by ______________________

D) In a beam subjected to transverse loads only, “pure bending condition” exists in the region where shear force is ______________________

E) An instrument used to measure the area of a drawing of a plot prepared after surveying the plot is ______________________

F) A soil consisting of particles of all possible sizes is known as ______________________

G) An instrument used to measure the difference in fluid pressure between two points in a pipe line is ______________________

P.T.O.
2. Choose the correct answer:

A) A transversal force acting away from the axis of a beam produces:
   i) Impact
   ii) Bending moment
   iii) Twisting moment
   iv) Fatigue

B) System of supplying irrigation water directly to the root zone of a plant is known as:
   i) Furrow irrigation
   ii) Sprinkler irrigation
   iii) Drip irrigation
   iv) Canal Irrigation

C) Instrument used to set out a simple curve on the ground using the method of deflection angles is:
   i) Tilting Level
   ii) Tachymeter
   iii) Theodolite
   iv) Dumpy Level

D) To measure the quantity of flow of water in a pipe line a venturymeter is preferred to orifice meter because:
   i) It is giving better reading
   ii) It is cheaper than orifice meter
   iii) It has lower head loss than in orifice meter
   iv) It is easy to measure the flow

E) If any three co-planar non parallel forces acting on a rigid body are keeping it under equilibrium then they are:
   i) Non concurrent
   ii) Producing a moment
   iii) Concurrent
   iv) Forming a couple

F) Without adding extra water, the workability of a fresh concrete can be increased by adding:
   i) Puzzolanic material
   ii) Plasticisers
   iii) Additional quantity of cement
   iv) Gypsum powder

G) In planning of a construction project “Mass diagram” is useful which provides information about:
   i) Total cost of the project
   ii) Quality of construction
   iii) Quantity of materials to be moved
   iv) Total time of construction
3. **Answer in one sentence:**
A) Why expansion joints are provided in concrete pavements?
B) What is the use of prismatic compass?
C) What is the difference between absolute pressure and gauge pressure?
D) What is Chejja?
E) Define “Bar chart” used in construction management.
F) Effect of pore water pressure on shear strength of soil.

**PART – B**

4. A) A block weighing 1000 N is placed on an inclined plane surface as shown in Fig. 1. Determine the magnitude of the horizontal force ‘F’ required to cause impending motion up the plane.

![Fig. 1](image1)

B) Determine the stresses in different segments of a circular bar as shown in Fig. 2. Compute the total elongation of the bar if modulus of elasticity ‘E’ is 200GPA for the material.

![Fig. 2](image2)

**OR**

Explain the method of computing deflection at the centre of the beam shown in Fig. 3, using moment area method. Modulus of elasticity of the beam material is ‘E’ and moment of inertia of the section of the beam is ‘I’.

![Fig. 3](image3)
5. A) Find the R.L of the top of a chimney using the following data:

<table>
<thead>
<tr>
<th>Instrument station point</th>
<th>Reading on Bench mark in m</th>
<th>Angle of elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.862</td>
<td>18° 36'</td>
</tr>
<tr>
<td>B</td>
<td>1.222</td>
<td>10° 12'</td>
</tr>
</tbody>
</table>

Stations A, B and the chimney are in the same vertical plane. Distance between A and B is 50 m. RL of Bench mark is + 100.00 m.

OR

Write **two** or **three** sentences about the following:

i) Definition of “Levelling”

ii) Box sextant

iii) Line of collimation

iv) Contour and

v) Local attraction.

B) Briefly explain the classification of roads of our country on the basis of location and function (As per Nagpur road plan).

6. A) Explain different modes of failure of an earthen dam.

B) What is a “Pressure filter”? What are the advantages and disadvantages of this type of filter?

OR

Write the sketch of a venturimeter and mention different parts. Derive the discharge equation required to compute the quantity of water flowing in a pipe using the venturimeter.


OR

Explain the method of determining “Shear strength parameters” of clayey silt by conducting “Unconfined compression test”.

B) With the help of neat sketches explain:

i) Doglegged stairs and

ii) Corner window (Only Plans may be used).
MATHEMATICS

Duration: 3 Hours

Max. Marks: 100

INSTRUCTIONS

1. Answers should be written only in English.
2. Answer all questions.
3. Write answers for objective and descriptive type of questions in the Answer book itself.

PART - A

(Each sub-question carries one mark)

1. Fill in the blanks.

A) The number of all positive divisors of 960 is __________

B) The limit of the sequence \( \frac{1+2+3+ \ldots + n}{2n^2 + 3n} \) is __________

C) The \( n^{th} \) derivative of \( \log(1 - 2x) \) is __________.

D) The Integrating factor of the differential equation \( \frac{dy}{dx} + \frac{2}{x} y = x^3 \) is __________

E) \( \text{L}^{-1}\left[ \frac{1}{3s^2 + 16} \right] = \) __________

F) If \( \vec{a} = (1, 1, 1), \vec{b} = (1, 2, 3), \vec{c} = (2, 1, 4) \) then \( \vec{a} \times (\vec{b} \times \vec{c}) \) is __________

G) The rank of the matrix \( A = \begin{bmatrix} 1 & 3 & -2 \\ 2 & -1 & 4 \\ 1 & -11 & 14 \end{bmatrix} \) is __________

P.T.O.
2. Choose the correct answer.

(Correct answer should be chosen from among the 4 choices given)

Question No. 2 Marks: 7\times 1=7

A) The least non-negative remainder obtained when 64\times 65\times 66 is divided by 67 is

a) 60 b) 61
c) 62 d) 63

B) If \( z = \frac{x}{y} + \frac{y}{x} \) then \( \frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = \)

a) 0 b) 1
c) −1 d) 2

C) The area bounded by the straight lines \( x = 0, x = 2 \) and the curves \( y = 2^x, y = 2x - x^2 \) is

a) \( \frac{3}{\log_2} + 4 \) b) \( \frac{3}{\log_2} - \frac{4}{7} \)
c) \( \frac{3}{\log_2} - \frac{4}{3} \) d) \( \frac{4}{7} - \frac{\log_2}{3} \)

D) If the function \( f(x) = 2x^3 - 9ax^2 + 12a^2x + 1 \) where \( a > 0 \) attains its maximum and minimum at \( p \) and \( q \) respectively such that \( p^2 = q \) then \( a \) is equal to

a) 1 b) 3
c) −1 d) 2

E) \( \int_0^2 \int_0^2 (x^2 + y^2) \, dx \, dy = \)

a) \( \frac{22}{3} \) b) \( \frac{20}{3} \)
c) \( \frac{21}{4} \) d) \( -\frac{22}{3} \)
F) The acute angle between the planes $2x + 2y - 3z - 5 = 0$ and $3x - 3y + 5z - 6 = 0$ is

a) $\cos^{-1}\left(\frac{15}{\sqrt{721}}\right)$

b) $\cos^{-1}\left(\frac{15}{\sqrt{731}}\right)$

c) $\cos^{-1}\left(\frac{15}{\sqrt{713}}\right)$

d) $\cos^{-1}\left(\frac{15}{731}\right)$

G) Which of the following statement is false

a) Every cyclic group is abelian.

b) If $f: R \rightarrow R'$ be a homomorphism of ring $R$ in to ring $R'$ then $\text{Ker}f$ is a subring of $R$.

c) A homomorphism $f: G \rightarrow G'$ is said to be an isomorphism if $f$ is one-one.

d) Every finite group is isomorphic to a permutation group.

3. **Answer briefly.**

   **Question No. 3 Marks : $6 \times 1 = 6$**

A) Show that $\mathbf{F} = (6xy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (3xz^2 - y)\hat{k}$ is irrotational.

B) Show that the set $S = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ is linearly independent in $V_3(R)$.

C) $f(x, y) = x^2 - y^2$ is a harmonic function. State true or false.

D) Find $A^{-1}$ if $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

E) Write Lagrange's interpolation formula for unequal intervals.

F) Evaluate $\Delta^{10}[\left(1 - ax\right)\left(1 - bx^2\right)\left(1 - cx^3\right)\left(1 - dx^4\right)]$
PART – B
SECTION – 1

Answer the following questions. \hspace{1cm} (5\times4=20)

4. a) Define the congruence relation on \( \mathbb{Z} \) and show that the relation ‘congruence modulo \( m \)’ is an equivalence relation on \( \mathbb{Z} \cdot (\mathbb{Z} \) is the set of integers).

OR

b) Discuss the convergence of the series \( \frac{x^2}{2\sqrt{1}} + \frac{x^3}{3\sqrt{2}} + \frac{x^4}{4\sqrt{3}} + \ldots \)

5. a) State and prove Cauchy Mean Value Theorem of real analysis.

OR

b) Find the volume of the solid generated by revolving the cardioid \( r = a(1 + \cos \theta) \) about the initial line.

6. a) Show that the family of ellipses \( \frac{x^2}{a^2 + \lambda} + \frac{y^2}{b^2 + \lambda} = 1 \) is self orthogonal. (\( a \) and \( b \) are constants, \( \lambda \) is a parameter)

OR

b) Find an expression for the shortest distance between two skewlines whose vector equations are given by \( \mathbf{r} = \mathbf{a} + \lambda \mathbf{\alpha} \) and \( \mathbf{r} = \mathbf{b} + \mu \mathbf{\beta} \).

7. a) Prove that every homomorphic image \( G' \) of a group \( G \) is isomorphic to some quotient group thereof.

OR

b) Verify convolution theorem for the function \( f(t) = \sin t, g(t) = e^t \) using Laplace transform.
8. a) Solve \((y - z)p + (z - x)q = (x - y).\)

OR

b) Find the bilinear transformation which maps \(z = \infty, i, 0\) onto \(w = 0, i, \infty.\)

SECTION – 2

Answer the following questions:

(5x12=60)

9. a) If \(y = a \cos \left[ n \log \left( \frac{x}{n} \right) \right]\) prove that \(x^2 y_{n+2} + (2n + 1)x y_{n+1} + 2n^2 y_n = 0.\)

b) Obtain Maclaurin’s expansion of \(\log \sec x.\)

OR

c) Show that a rectangular solid of maximum volume which can be inscribed in a sphere is a cube.

d) Evaluate \(\int_0^{1} \int_{x^2}^{2-x} x y \, dx \, dy\) by changing the order of integration.

10. a) Solve \((D^2 - 2D + 1)y = xe^x \sin x.\)

b) Solve by the method of variation of parameters \(\frac{d^2 y}{dx^2} - y = \frac{2}{1 + e^x}.\)

OR

c) Show that the lines \(\frac{x - 1}{2} = \frac{y - 2}{2} = \frac{z - 3}{1}\) and \(\frac{x - 2}{3} = \frac{y - 2}{2} = \frac{z - 6}{4}\) are coplanar and find the equation of the plane containing them.

d) \(R\) be the ring of all \(2 \times 2\) matrices with their elements as integers and
\[ S = \left\{ \begin{pmatrix} a & 0 \\ b & 0 \end{pmatrix} : a, b \in \mathbb{Z} \right\}. \] Show that \(S\) is a left ideal in \(R\), but not a right ideal.
11. a) Find the cube roots of \((\sqrt{3} + i)\) and represent them on the Argand plane.

b) If \(n\) is a non-zero constant, show that \(\nabla^2 r^n = n(n+1)r^{n-2}\). Deduce that when \(r \neq 0\), \(r^n\) is harmonic if and only if \(n = -1\).

OR

c) Using Gauss divergence theorem

evaluate \(\iiint_S \vec{F} \cdot \hat{n} \, ds\) where \(\vec{F} = 4x\hat{\imath} - 2y^2\hat{j} + z^2\hat{k}\) and \(S\) is the surface enclosing the region for which \(x^2 + y^2 \leq 4\) and \(0 \leq z \leq 3\).

d) Solve by Charpit’s method

\[pxy + pq + qy - yz = 0.\]

12. a) A particle which is performing Simple Harmonic motion of period \(T\) about a centre \(O\) passes through a point \(P\) with velocity \(V\) in the direction \(OP\). Prove that the time which elapses before it returns to \(P\) is \(\frac{T}{\pi} \tan^{-1} \left( \frac{VT}{2\pi OP} \right)\).

b) A particle is thrown over a triangle from one end of a horizontal base and grazing over the vertex falls on the other end of the base. If \(A, B\) be the base angles of the triangle and \(\alpha\) the angle of projection, prove that \(\tan \alpha = \tan A + \tan B\).

OR

c) Show that \(u = e^x \sin y + x^2 - y^2\) is harmonic and find its harmonic conjugate.

d) Evaluate \(\int_c \frac{z}{(z^2+1)(z^2-9)} \, dz\) where \(c: |z| = 2\).
13. a) Find the minimum value of \( z = -x + 2y \) subject to the constraints: 
\[-x + 3y \leq 10, \quad x + y \leq 6, \quad x - y \leq 2, \quad x, y \geq 0\]
using graphical method.

b) Obtain all the basic feasible solutions of the system of linear equations

\[
\begin{align*}
    x_1 + 2x_2 + x_3 &= 4 \\
    2x_1 + x_2 + 5x_3 &= 5
\end{align*}
\]

OR

c) Find a real root of the equation \( xe^x - 2 = 0 \) correct to three decimal places using Newton-Raphson method.

d) Solve \( \frac{dy}{dx} = 3x + \frac{y}{2} \) using Runge-Kutta method with \( y(0) = 1 \). Compute \( y(0.2) \) by taking \( h = 0.2 \).
AGRICULTURE

Duration : 3 Hours

Maximum Marks : 100

INSTRUCTIONS

1. Answers should be written only in English.
2. Answer all questions taking note of choice questions wherever given.
3. Write answers for objective and descriptive type questions in the Answerbook itself.

PART – A
(Each sub-question carries one mark)

1. Fill in the blanks :  (10×1=10 Marks)
   a) __________________ is the major processed product of mango prepared and exported from India.
   b) In acid soils, availability of added P is less due to its fixation in the soil as _______________ and _______________ phosphates.
   c) Cliestogamy refers to _______________ condition of the flower.
   d) The example for reflecting type of antitranspirant is _______________.
   e) The insect vector _______________ transmits katte disease of cardamom and bunchy top of banana.
   f) Proportionate rate of change in output to proportionate rate of change in input is called _______________.
   g) A quality seed should be _______________ pure and possess high _______________ and _______________.
   h) Meloidogyne sp. causes _______________ disease in vegetables.
   i) Plant growth hormone that helps for chlorophyll retention in leaves is _______________.
   j) Swarnajayanti Gram Swarozgar Yojana, a Self-employment Generation Programme was implemented in the country in the year _______________.

P.T.O.
2. Choose the right answer: 

a) Commonly cultivated potato is a
   a) Auto tetraploid    b) Auto hexaploid
   c) Diploid          d) Triploid

b) The ‘active soil forming factors’ are
   a) Parent material & Climate
   b) Climate & Time
   c) Climate & Biota
   d) Time & Relief

c) Single Seed Descent method of selection is practised in the following generation
   a) F1              b) F2
   c) F6              d) None of the above

d) The herbicide Glyphosate is
   a) Non-selective contact    b) Non-selective translocated
   c) Both of these          d) None of these

e) A pest which is found both in field and storage on sweet potato is
   a) Phthorimae operculatea b) Cynlas formicarius
   c) Lasioderma serricorne d) Trogoderma glanarium

f) In a regulated market
   a) Arrivals of agricultural produce is regulated
   b) Market practice for agricultural produce is regulated
   c) Price of the agricultural produce is regulated
   d) Demand for agricultural produce is regulated
g) ____________ represents the point of attachment of seed to its stalk.
   a) Hilam
   b) Raphe
   c) Micropyle
   d) Plumule

h) Flagellation is genus Erwinia is
   a) Amphitrichous
   b) Lophotrichous
   c) Monotrichous
   d) Peritrichous

i) Chlorophyll molecule contains the following mineral elements
   a) Fe and Mg
   b) N and Mg
   c) 2n and Fe
   d) S and N

j) An extension method which aims at showing the value or worth of new practice is
   a) Method demonstration
   b) Result demonstration
   c) On campus training
   d) Off campus training

PART – B

Write short notes on any five of the following: (5x4=20 Marks)

3. Use of root stocks in citrus.
4. Salt affected soils and their management.
5. Mutation and the procedure of mutation breeding in crop plant improvement.
6. Water-use efficiency.
7. World Trade Organization.
8. Maintenance of Genetic purity during seed production.
10. Factors to be considered in selection of appropriate extension methods for effective transfer of technology.
Answer any five of the following: (5x12=60 Marks)

11. Problems and prospects in cultivation and processing of fruit, vegetable and flower crops in India.

12. What are the salient features of 'Soil Taxonomy' and its structure? How different 'Categories' in the system are differentiated? List the ten common Soil Orders with their major characteristics.

13. Define heterosis and explain different types of heterosis. Explain the two theories of heterosis, their objections and clarifications. Also, explain how heterosis has been exploited in rice.

14. Define watershed and discuss the role of watershed management for sustainable agricultural production including the components, objectives, approaches and strategies for implementation of watershed development programme.

15. Mention four important pests of coconut along with nature of damage, damage symptoms and management practices.

16. Define seed deterioration and causes for the same. What are the visible and non-visible expressions of seed deterioration? Briefly explain three important methods of measuring seed deterioration.

17. Explain in detail economic importance, symptoms, cause, epidemiology and integrated management of stem rust of wheat.

18. i) Write the diagram of 'Z' scheme of light reaction.
   
   ii) Mention the different phases of dark reaction (C3 pathway) and explain the reductive phase neatly.
   
   iii) Explain different environmental factors affecting photosynthesis and productivity.
FORESTRY – II

Duration : 3 Hours

Max. Marks : 100

INSTRUCTIONS

1. Answer should be written only in English.
2. Answer all questions taking note of choice questions wherever given.
3. Write answers for objective and descriptive type questions in the Answer book itself.

PART – A
(Each Sub-question carries one mark)

1. Fill in the blanks :

   A) The form factor is used for the purpose of estimation of _____________ of standing trees.

   B) Bagasse as one of the agricultural sources is used in _______________ manufacture.

   C) The fibre obtained from Caryota urens is called as ______________ fibre.

   D) The Biodiversity Treaty was signed by 171 countries including India at the Earth Summit in Brazil in the year ________________

   E) The size and distribution of several ecosystems and their interactions across a given land surface is referred to ______________ diversity.

   F) Diversion of forest area to agricultural purpose was emphasized in that National Forest Policy enunciated during the year ________________

   G) Electrostatic precipitation is generally used as a method for measurement of _______________ pollution.

2. Choose the correct answer :

   A) It is one of the bad fuel wood species.
      i) Sissoo    ii) Oak    iii) Jamun    iv) Maharukh

   B) The biomass estimation on unit area basis is done based on categorization of diameter classes in
      i) Stratified tree technique    ii) Mean tree technique
      iii) Unit area method    iv) Basal area proportion method
C) In unmanaged forests, rotation tends to be longer because
   i) The growth of individual tree is boosted
   ii) The growth of individual tree is retarded
   iii) There is no intense competition
   iv) None of these

D) The voluntary organization involving women and children in Social Forestry Programme is
   i) Sadguru Seva Sangh
   ii) Anand Niketan Ashram
   iii) Society for Wasteland Development
   iv) The Ulthan trust

E) Cineole oil which is mostly used in pharmaceutical industry is obtained from the leaves of
   i) Neem    ii) Babul    iii) Sal    iv) Eucalyptus

F) The most important factor influencing commercial farm forestry for adoption by small farmers for returns is
   i) Long gestation period    ii) Lack of suitable trees
   iii) Bulkness of products    iv) Low returns

G) Because of its toughness combined with light weight and amenability to neat scooping by hand tools, willow is the ideal timber used for
   i) Railway coaches    ii) Shoelasts
   iii) Artificial limbs    iv) Pitprops

3. Answer in one sentence: Question No. 3 Marks: 6×1=6
   A) What is stereoscopy?
   B) What is Ex-situ conservation of Biodiversity?
   C) What are the growth rings?
D) Define GAI.

E) What is Pinknot?

F) What does the term ‘Canes’ represent?

PART – B

SECTION – I

Write short notes on any five of the following: 5x4=20

4. The advantages of remote sensing.

5. Strategy for popularising non timber forest produce.

6. Sub divisions of indirect values provided by biodiversity that do not involve harvesting or destroying the natural resources.

7. Manifold uses of essential oils from which man is benefited.

8. Two distinct strains of lac insects in India.

9. Types of forest fires classified on the basis of their intensity and place of action.

10. Collection and curing of Tendu leaves.


SECTION – II

Answer any five of the following questions: 5x12=60

12. Discuss the process of estimation of growing stock in preparation of forest inventory. 12

13. Describe the standard rules governing breast height measurement under different tree stem positions along with neat diagrams. 12

14. Explain the ill effects of deforestation causing damage to the environment in various ways. 12
15. Discuss the various issues to be considered for implementation to achieve the goals of sustainable forest management and biodiversity conservation.

16. a) What is seasoning? Write the objectives of seasoning wood.
    b) Write the common seasoning defects and causes which bring about these defects.

17. Explain the important decisions to be frequently made by the foresters wherein economic analysis can be usefully employed.

18. a) What are the effects of grazing on forests?
    b) Explain the direct control measures for regulation of grazing in Forest areas.

19. a) Discuss the important points in fixing the rotation, if we analyse the rotations fixed to various forest crops.
    b) Explain the various kinds of rotations classified based on the objects of management and also of necessity.
FORESTRY – I

Duration : 3 Hours
Maximum Marks : 100

INSTRUCTIONS

1. Answer should be written only in English.
2. Answer all questions taking note of choice questions wherever given.
3. Write answers for objective and descriptive type questions in the Answer book itself.

PART – A

(Each sub-question carries one mark)

Question No. 1 Marks : 7x1=7

1. Fill in the blanks :
   A. The hedge rows are cut back and kept pruned during the cropping period in ________________ type of Agroforestry Practice.

   B. A practice of raising trees on canal banks, railway lines, road sides etc. is termed as ________________ forestry.

   C. Plant succession that comes up in areas which have previously not borne in any form of vegetation is called ________________ succession.

   D. Bamboo is multiplied naturally annually during the rains from ________________.

   E. Cutting of trees at a height of 2 meters for green leaf manuring and avoiding shade effect on intercrops in an agroforestry system is known as ________________

   F. Suppressed, dominated and diseased trees are removed in ________________ thinning type.

   G. The best approach of alternate land use in watershed areas is ________________ system to enhance the production without disturbing the ecosystem.
2. Choose the correct answer.

A. Mimosine content is subabul leaves can be reduced to half by immersing in solution of
   i) Sodium chloride       ii) Ferrous sulphate
   iii) Potassium chloride  iv) Ammonium sulphate

B. The model watershed programmes are being implemented by different State Governments under technical supervision of
   i) ICRISAT     ii) IGFRi     iii) CIDA        iv) CRIDA

C. Sporadic flowering occurs in this tree species.
   i) Bamboo     ii) Teak      iii) Casuarina    iv) Sandal wood

D. The suitable agroforestry system for class IV and above lands is
   i) Agri horticulture   ii) Agri silvipastoral
   iii) Agri hortipastoral iv) Silvipastoral

E. Forest is defined as a plant community comprising mainly of trees and associated woody vegetation usually with a close canopy according to
   i) Legal definition    ii) General definition
   iii) Ecological definition iv) Dictionary

F. The wrenching operation in seed bed is done for
   i) Shoot manipulation   ii) Population manipulation
   iii) Root manipulation  iv) Soil manipulation

G. A tree which appears phenotypically desirable and is to be evaluated is called
   i) Candidate tree      ii) Select tree
   iii) Plus tree         iv) Elite tree
3. Answer in one sentence:
   A. What is Form factor?
   B. What is pricking out?
   C. What are the characteristic features of the habitat of Mangrove vegetation?
   D. What does Silvics deal with?
   E. What is the mixture used for making bricks in brick planting method?
   F. What is the purpose of D & D methodology followed in Agroforestry systems?

PART – B

SECTION – I

Write short notes on any five of the following: (5x4=20)

4. Importance of succession in Silviculture.
5. Operations usually prescribed in improvement felling.
6. Advantages with mycorrhhizae fungi inoculation.
7. The principles and benefits of watershed management.
8. Precautions for establishing seed orchards.
10. Utility of vegetative propogation in tree improvement.
11. Use of Bamboo for different purposes.
SECTION – II

Answer any five of the following questions: (5×12=60)

12. a) Write afforestation measures for coastal region for control of wind erosion. 4
   b) Discuss the scope of Urban Forestry. 8

13. a) Write the various types of efforts made to obtain people’s participation in Social Forestry Programmes. 4
   b) Write the major constraints in people’s participation in Social Forestry Programmes. 8

14. Explain different operations for obtaining natural regeneration of a species in desired quantity, at a desired time and at a desired place. 10

15. a) Write the main difficulties which arise in tree breeding programmes. 4
   b) Explain the various stages in tree improvement programme. 8

16. a) Write the Silvicultural characters and natural regeneration of Acacia auriculiformis. 6
   b) Write the distribution of Hardwickia binata in Karnataka and important features of the species. 6

17. Explain the beneficial effects of trees on soils with respect to the following aspects:
   a) Additions to soil  b) Reduction of losses from the soil
   c) Physical properties of soil  d) Chemical properties of soil

18. What does Nitrogen Fixing Tree (NFT) refer to? Give justifications for recommending Nitrogen Fixing Trees in agroforestry systems. 10

19. What is Tending? Explain the various operations involved in tending for well being of a forest crop.
CHEMISTRY

Time: 3 Hours

Max. Marks: 100

INSTRUCTIONS

1) Answers should be written only in English.

2) Answer all questions.

3) Write all your answers (Objectives/Descriptives) in the answerbook itself.

PART – A

(Answer all the questions. Each Sub-question carries one mark)

Fill in the blanks:

1. a) The electronic configuration of element copper (atomic number 29) is ________________.

   b) The radius of Na⁺ is ______________ than the radius of Na atom.

   c) The hybridised state of C in C₂H₆ is ______________.

   d) The abbreviation LCAO stands for ______________.

   e) The metal present in haemoglobin is ______________.

Fill in the blanks:

2. a) An example of a hexadentate ligand is ______________.

   b) All spontaneous processes are accompanied by ______________ in entropy.

   c) The catalyst used in Friedel-Craft's alkylation is ______________.

   d) The number of peptide bonds present in tetrapeptides is ______________

   e) The region of electromagnetic radiation useful in the study of vibrational transitions is ______________ region.
3. a) Arrange the following in the increasing order of their bond strength:

\[ O_2^-, O_2^+, O_2^-, O_2 \]

b) Arrange the following in the increasing order of their stabilities:

\[ \begin{array}{c}
  \text{CH}_3 \text{CH}_2 \text{CH}_3 \\
  \text{CH}_3 \text{CH}_2 \text{CH}_3 \\
  \text{CH}_3 \text{CH}_2 \text{CH}_3 \\
  \text{CH}_3 \text{CH}_2 \text{CH}_3 \\
\end{array} \]

c) Which one of the following is most acidic?

\[ \text{CH}_3\text{COOH}, \text{ClCH}_2\text{COOH}, \text{CH}_3\text{CH}_2\text{COOH} \]

d) Write the zwitter ion structure of Alanine.

e) Write the Nernst equation for single electrode potential.

4. a) How is half life related to the order of a reaction?

b) How does molar conductance and specific conductance of a weak electrolyte vary with dilution?

c) Identify the electrophile in an aromatic sulphonation reaction.

d) Give an example each for reducing and non-reducing sugars.

e) Define the term ‘enantiomers’.

PART – B
SECTION – 1

Answer all the questions. Each question carries 4 marks. Some questions have internal choice.

5. a) Transition metals form coloured compounds with other elements. Give reason.

b) \( K_3 [\text{Co F}_6] \) is highly paramagnetic but \( [\text{Co (NH}_3)_6] \text{Cl}_3 \) is diamagnetic. Give reason.
6. For the reaction sequence

\[ \frac{k_1}{k_2} \quad A + A \xrightarrow{k_1} A^* + A \xrightarrow{k_2} \text{products} \]

assuming steady state approximation for \( A^* \), find the order of the reaction if \( k_2 \gg k_3 \).

OR

For the cell \( \text{Zn} \mid \text{Zn}^{2+}(0.01 \text{M}) \parallel \text{Cu}^{2+}(0.05 \text{M}) \mid \text{Cu} \) calculate the equilibrium constant for the spontaneous cell reaction at 298 K.

\[
\left[ E_{\text{Zn}}^o = -0.76 \text{V} ; E_{\text{Cu}}^o = +0.34 \text{V} \right]
\]

7. a) Set up the M.O. diagram of \( \text{O}_2 \) molecule and comment on its magnetic nature.

b) Explain with an example, the mechanism of a homogeneously catalysed reaction.

8. a) Describe the E₂ mechanism in which the H leaves first and then the X. In what kind of reactions is this mechanism more likely to be followed?

OR

b) Identify A, B, C, D and E and write their structures in the following reaction sequence.

\[ \text{R} - \text{C} - \text{NH}_2 \xrightarrow{\text{OBr}^-} A \xrightarrow{\text{OH}^-} B \xrightarrow{1,2\text{shift}} C \]

\[ \text{CO}_2 + \text{R} - \text{NH}_2 \xrightarrow{\text{H}_2\text{O}} E \xrightarrow{\text{c to N}} \]

9. a) Write the structures of E and Z forms of 3-methyl-2-pentene.

b) Draw the structure of 3, 4-Dimethyl-1-pentene and identify the stereogenic centre.

OR
c) Write the configuration and IUPAC name of the following molecule

\[
\text{[diagram of a molecule]}
\]

d) How are the following molecules related?

\[
\text{[diagram of two molecules]}
\]

**SECTION – 2**

Answer all questions availing internal choice. Each question carries twelve marks.

5×12 = 60

10. a) Write all possible values of quantum numbers \( l \) and \( m \) for the principal quantum number \( n = 3 \).

b) Set up the Born-Haber cycle for the formation of \( \text{NaCl(s)} \) and show how its lattice energy can be evaluated from this.

c) Calculate the spin only magnetic moment of \( \text{Mn}^{4+} \) species.

11. a) Explain ‘ionisation isomerism’ exhibited by coordination compounds with an example.

b) Draw the structure of ferrocyanide ion, indicate the hybridisation state of Fe in the ion and comment on its magnetic character.

c) Draw the structures of \( \text{CO}_2 \) and \( \text{H}_2\text{O} \) molecules and comment on their dipole moments.

d) Explain lanthanide contraction.
12. a) The rate constants for a reaction at 300 K and 400 K are $4 \times 10^{-4}$ s$^{-1}$ and $2 \times 10^{-2}$ s$^{-1}$ respectively. Find the activation energy for this reaction.

b) $\Delta H$ and $\Delta S$ for a reaction are 60 kJ mol$^{-1}$ and 40 JK$^{-1}$ mol$^{-1}$ respectively. At what temperatures the reaction becomes spontaneous?

c) Write the Debye Huckel Onsager equation and explain the terms.

d) Zinc displaces copper from an aqueous solution of CuSO$_4$. Give reason.

OR

e) How does the enthalpy of a reaction vary with temperature? Derive this equation.

f) What are ‘active centres’? How can they be increased?

g) Calculate the entropy change when 10 moles of an ideal gas undergoes isothermal reversible expansion from 10 dm$^3$ to 100 dm$^3$ at 300 K. ($R = 8.314$ JK$^{-1}$ mol$^{-1}$)

h) A reaction

A + B $\rightarrow$ Products

yielded the following experimental data. Find the order of the reaction.

<table>
<thead>
<tr>
<th>Concentration of A</th>
<th>Concentration of B</th>
<th>Rate of the reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 M</td>
<td>0.5 M</td>
<td>x</td>
</tr>
<tr>
<td>1.0 M</td>
<td>0.5 M</td>
<td>2x</td>
</tr>
<tr>
<td>0.5 M</td>
<td>1.0 M</td>
<td>4x</td>
</tr>
</tbody>
</table>

13. a) Give a structure consistent with each of the following sets of NMR data

i) $\text{C}_4\text{H}_9\text{Br}$

- doublet $\delta$ 1.04, 6 H
- multiplet $\delta$ 1.95, 1 H
- doublet $\delta$ 3.33, 2 H

ii) $\text{C}_{10}\text{H}_{13}\text{Cl}$

- singlet $\delta$ 1.57, 6 H
- singlet $\delta$ 3.07, 2 H
- singlet $\delta$ 7.27, 5 H
b) Explain how the configurations of compounds containing more than one chiral carbon be established taking 2, 3, 4- Trihydroxy butanal as an example.

OR

c) How was the open chain structure of D-fructose established?

d) What are the shortcomings of the open chain structure? How were they overcome?

14. a) Describe the mechanism of Beckmann rearrangement. Using this rearrangement, write the conversion of Cyclohexanone to caprolactam.

OR

b) As an evidence for SN₂ mechanism describe the conversion of

\((+)-1\text{-phenyl-2-propanol}\)

i) \((-)\text{-ether}\) and ii) \((+)\text{-ether}\) and explain where exactly inversion takes place.

c) Give another kind of evidence for SN₂ mechanism using compounds with potential leaving groups at bridge head carbons.
BOTANY

Duration : 3 Hours

Max. Marks : 100

INSTRUCTIONS

1. Answer should be written only in English.
2. Answer all questions.
3. Write answers for objective and descriptive type question in the Answerbook itself.

PART – A

(Each sub-question carries one mark)

Question No. 1 Marks : 7×1=7

1. Fill in the blanks:
   A. Loss of liquid water by guttation occurs through ____________
   B. Citrus canker is caused by ______________
   C. Special types of rejuvenating spores produced by diatoms are called ______________ 
   D. Structure of chromosome is clearly visible during ______________
   E. The transfer of genetic material of one bacterium to another by virus is called ______________
   F. In Angiosperms, triple fusion results in the formation of ______________
   G. Smog is a result of ______________

2. Choose the correct answer:
   Question No. 2 Marks : 7×1=7
   A. In which of the following groups would you place a plant which produces spores, has vascular tissues and lacks seeds?
      i) Algae          ii) Bryophytes
      iii) Pteridophytes iv) Gymnosperms

P.T.O.
B. Persistent calyx and oblique carpels are the salient features of the family
   i) Apocyanaceae    ii) Leguminaceae
   iii) Solanaceae    iv) Asteraceae

C. Simple tissues are these
   i) Parenchyma, xylem and collenchyma
   ii) Parenchyma, collenchyma and sclerenchyma
   iii) Parenchyma, xylem and sclerenchyma
   iv) Parenchyma, xylem and phloem

D. Jack fruit is a
   i) Syconus    ii) Sorosis
   iii) Berry    iv) Pepo

E. Potometer is an instrument used for measuring the rate of
   i) Respiration    ii) Transpiration
   iii) Growth    iv) Translocation

F. 1:2:1 genotypic ratio in a monohybrid cross indicates
   i) Dominance
   ii) Segregation
   iii) Independent Assortment
   iv) Co-ordination

G. Acid rain is caused due to increase in the concentration of
   i) Carbon dioxide    ii) Carbon monoxide
   iii) Nitrous oxides    iv) Sulphur dioxide

3. Answer in one sentence:

A. What are cristae?
B. What is Etiology?
C. Define cleistogamy.
D. Where do you find Casparian thickenings?
E. Name the fungus from which Gibberlin is extracted.
F. What are thylakoids?
PART – B

SECTION – 1

4. Write notes on:
   A. Salient features of Apocyanaceae.
   OR
   B. Sporophyte of Marchantia.

5. A. Air pollution
   OR
   B. Types of vascular bundles.

   OR
   B. Thallus organisation in Algae.

7. A. Economic importance of Lichens.
   OR
   B. Significance of Transpiration.

8. A. Koleroga
   OR
   B. Synangium of psilotum.

SECTION – 2

9. Answer the following:
   (5×12=60)
   A. Describe briefly prophase-1 of Meiosis in plant cell and add a note on the significance of Meiosis.
   OR
   B. Give a detailed account on vegetation of Karnataka.
10. A. Describe the structure of Double helix model of DNA and add a note on DNA replication.

OR

B. Define photo-phosphorylation. Describe cyclic and non-cyclic photo-phosphorylation.

11. A. Describe the life cycle of Puccinia on wheat plant.

OR

B. What is Soil Erosion? Explain the various types of Soil Erosion and steps involved in soil conservation.

12. A. What is plant succession? Give a brief account on xerosere.

OR

B. Describe the process of double fertilization in angiosperms.

13. A. Mention the salient features of the following families with two examples:
   i) Musaceae
   ii) Brassicaceae
   iii) Cucurbitaceae.

OR

B. Write the Botanical name, family, part used and economic importance of the following:
   i) Wheat
   ii) Clove
   iii) Groundnut
   iv) Coffee
   v) Ravoulia
   vi) Tobacco
INSTRUCTIONS

1) Answer should be written only in English.
2) Answer all questions.
3) Write your answers (Objective/Descriptive) in the answer book itself.

PART – A
(Each sub-question carries one mark)

Fill in the blanks :  

Question No. 1  Marks : 5×1=5
A) The rms velocity of gas molecules on the basis of Kinetic Theory of Gases is given by _________.
B) When the tension of a stretched string is increased four times and the length of the string is doubled, then the frequency of the string is _________ as compared to the original frequency.
C) When the monochromatic yellow light is replaced by blue light in the Fresnel’s Biprism interference experiment, then the width of the fringes ____ and the fringes are _________ in the field of view.
D) The power factor of a series LCR circuit at resonance is _________
E) The graph of de-Broglie wavelength of an electron plotted against its linear momentum gives _________

Choose the Correct Answer :

Question No. 2  Marks : 5×1=5
A) In a diffraction grating experiment, the grating has $10^5$ rulings. Then, in the wavelength region of 5000Å of the spectrum and in the second order, the grating can resolve two lines with a wavelength difference of
   a) 25Å  b) 2.5Å  c) 0.25Å  d) 0.025Å
B) The electric field components of a plane electromagnetic wave are given by $E_x = 2E_0 \cos (\omega t - kz)$ and $E_y = E_0 \sin (\omega t - kz)$. The state of polarization of the wave will be
   a) Circular  b) Plane  c) Elliptical  d) Unpolarised
C) The mass of a proton is 1836 times the mass of an electron. They are projected into a uniform magnetic field with the same kinetic energy at right angles to the field direction. Then,
   a) The electron trajectory is less curved than the proton trajectory
   b) The proton trajectory is less curved than the electron trajectory
   c) Both the trajectories are equally curved
   d) Both the trajectories are straight

D) The position and momentum of 1 keV electron are simultaneously determined. If its position is determined within 0.4 nm, the percentage uncertainty in its momentum is
   a) 1.5%  
   b) 2.2%  
   c) 4.4%  
   d) 6%

E) A Raman line at a wavelength of 462.4 nm was observed with exciting radiation of wavelength 435.8 nm. The corresponding Anti-stokes’ line is at a wavelength of
   a) 512.2 nm  
   b) 412.1 nm  
   c) 479.6 nm  
   d) 452.3 nm

Answer in one sentence:  Question No. 3  
Marks : 5×1=5

A) What is meant by invariance of Physical Laws?

B) What is Compton effect?

C) In a Bohr hydrogen atom, the angular momentum of electron is $3\hbar$. Find the energy of the electron in eV.

D) Where does it take longer time to cook rice in an open vessel: Bangalore or Himalayas? Why?

E) What is the percentage change in the optical rotation produced by a sugar solution if length is increased by 50% and concentration is decreased by 50% of its initial value?

State True or False:  Question No. 4  
Marks : 5×1=5

A) Efficiency of a Carnot engine can be 100%.

B) Waves in a stretched string can be either longitudinal or transverse.

C) The critical magnetic field is the external field applied on a superconductor to just destroy its superconductivity and convert into ordinary conductor.

D) The result of Michelson-Morley interference experiment showed that there was no ether drag. Further, it established the fact that the speed of light in free space is the same everywhere, regardless of motion of source or observer.

E) The molecular spectrum of a diatomic molecule lies only in the infrared region.
PART - B

SECTION - 1

(Each question carries four marks)

5. a) Mention the advantages of centre of mass frame as compared to that of a laboratory frame.

OR

b) Derive an expression for the force acting on a conductor carrying current kept in a magnetic field.

6. a) Define Mean free path of a gas molecule and obtain an expression for it.

OR

b) State and explain Pauli’s Exclusion Principle. How many electrons can be accommodated in a given shell?

7. a) Derive an expression for velocity of longitudinal waves in a rod.

OR

b) Describe the construction and working of Ruby Laser.

8. a) Mention the differences between Zone plate and convex lens.

OR

b) Distinguish between half-wave rectifier and full wave rectifier.


OR

b) Starting from the Lorentz transformation equations, derive the velocity addition theorem under special relativity.
SECTION – 2

(Each question carries 12 marks)

10. a) Derive Kepler’s laws from Newton’s law of gravitation.

OR

b) Describe the experimental set up for studying the anomalous Zeeman effect. Explain the theory of anomalous Zeeman effect.

11. a) Describe the characteristics of the energy spectrum of a black body. Derive the Planck’s law of radiation.

OR

b) Give the Huygens’ theory of double refraction. Explain Huygens’ construction for double refraction in Uniaxial negative crystals when optic axis is in the plane of incidence and parallel to the refracting surface for i) oblique incidence and ii) normal incidence.

12. a) Derive Maxwell’s equations of electromagnetism.

OR

b) Describe Millikan’s oil drop experiment to determine the charge of an electron.

13. a) Describe the Davisson – Germer experiment on electron diffraction with necessary theory.

OR

b) Obtain an expression for electrical conductivity of metals on the basis of free electron theory of metals.

14. a) Derive an expression for relativistic variation of mass with velocity.

OR

b) What is Hall effect ? Derive an expression for Hall coefficient in the case of metals. Qualitatively, explain the hall effect in p-type and n-type semiconductors. What is the significance of Hall effect in semiconductors?
ZOOLOGY

Time: 3 Hours

INSTRUCTIONS

1. Answers should be written only in English.
2. Answer all questions.
3. Write answers for objective and descriptive type questions in the Answer Book itself.

PART – A

Question No. 1 Marks: 7×1=7

1. Fill in the blanks with appropriate words:

   A) ________________ is the migration of fresh water fish to salt water for spawning.
   
   B) ________________ is the last stage in the prophase of first Meiotic division.
   
   C) ________________ is the principle moulting hormone of insects.
   
   D) ________________ bond binds monosaccharide to form a disaccharide and polysaccharide.
   
   E) ________________ are the internal asexual buds of sponges.
   
   F) The sessile, bottom dwelling organisms in an aquatic ecosystem are called ________________
   
   G) ________________ is the sensitive fleshy hanging process at the back of the soft palate.

2. What is pygostyle? What is its function? mark: 1

3. What are Weberian ossicles? mark: 1

4. Give the general formula of Vital Index. mark: 1

P.T.O
Mark: 1

6. Name the two Purine bases of RNA.  
Mark: 1

7. What are Leydig cells?  
Mark: 1

8. Give any two examples for Concealing mimicry.  
Mark: 1

9. **Choose the correct choice** from the following:  
**Question No. 9  Marks: 6x1=6**

A) Onchosphere is connected with  
   a) *Ascaris lumbricoides*  
   b) *Fasciola hepatica*  
   c) *Taenia solium*  
   d) *Plasmodium vivax*

B) The test of ascidians are made up of  
   a) Mucin  
   b) Tunicin  
   c) Chitin  
   d) Chondrin

C) Pick the reptile  
   a) Surinam toad  
   b) Desert toad  
   c) Clawed toad  
   d) Midwife toad

D) The inter cellular proteolytic enzyme, Cathepsin is synthesized by  
   a) Lysosomes  
   b) Ribosomes  
   c) Mitochondria  
   d) Golgi bodies

E) This Vitamin increases the absorption of Calcium and Phosphate in the gut.  
   a) Vit-A  
   b) Vit-B  
   c) Vit-C  
   d) Vit-D

F) Bidder’s organ is found in  
   a) Planaria  
   b) Star fish  
   c) Frog  
   d) Turtle
PART - B
SECTIOIN - I

10. a) Differentiate between Ecto and Endothermic animals. Give one example for each.

OR

b) Explain with suitable diagram the looping and somersaulting movement in Hydra.

11. a) Explain with diagrams the Pinocytosis and Phagocytosis.

OR

b) What is the difference between National Parks and Wild life Sanctuaries? Give one example for each.

12. a) List out three salient features of phylum Echidermata. Classify the phylum upto classes.

OR

b) Find out the probable offsprings of a woman who is normal but the father being colour blind marries a man who is normal but also with a colourblind father.

13. a) Describe Chloride shift.

OR

b) Describe Biological Magnification.

14. a) Draw a neat labeled diagram of the ventral view of brain of frog.

OR

b) Describe In Vitro Fertilization (IVF).
SECTION – II

15. a) Trace the evolution of aortic arches among vertebrates with suitable labeled diagrams.

OR

b) Describe the physiology of the transmission of nerve impulse.

16. a) Define fertilization. With the help of labeled diagrams explain the process and list out three important significances of this act.

OR

b) Describe the energy flow in a typical ecosystem.

17. a) List out the drawbacks of Darwinism and substantiate the modified Synthetic theory of evolution.

OR

b) What are proteins? Classify with examples and list out any four important functions of it to life.