PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

Each answer should not exceed 2 pages.

1. What is meant by environmental studies? Why is it important?
2. What are ecological pyramids?
3. Explain the term ‘disaster management’.
4. What are the causes of air pollution?

5. Briefly write about rain water harvesting.

PART B — (4 × 15 = 60 marks)

Answer any FOUR questions.

Each answer should not exceed 5 pages.

6. How to create awareness about environmental protection?

7. Give an account on Mineral resources.

8. Write the functional aspects of ecosystem.

9. Write the importance of biodiversity.

10. What is nuclear hazard? Explain.
11. Write an account on environment protection laws.

குறுக்கும் பாதுகாப்பு சட்டங்கள் விவரிக்கும்.

12. Give an account on Value Education in Environment.

கைவிழாக் கையில் - விவரிக்கும்.
Second Year
GROUPS AND RINGS

Time : 3 hours Maximum marks : 75

SECTION A — (5 × 5 = 25 marks)

Answer any FIVE questions.

1. Define relations and types of relations.

2. State principle of Induction.

3. Define a group and give examples.

4. Prove that (Z, +) is a sub group of (R,+).

5. Define normal subgroup.

6. Define Integral Domain.
7. Let I be an ideal of ring R. Then prove that if R is commutative \( \Rightarrow R/I \) is commutative.

8. Prove that every Euclidean ring is a ring with units.

SECTION B — (5 \times 10 = 50 marks)

Answer any FIVE questions.

9. Explain functions and types of functions with examples.

10. Prove that if every element of a group G has its own inverse than G is abelian.

11. State and prove Lagrange’s Theorem.

12. State and prove Cayley’s Theorem.

13. Prove that every finite integral domain is a field.
14. Show that the set of all matrices of the form
\[
\begin{pmatrix}
0 & x \\
0 & y
\end{pmatrix}
\]
x, y ∈ Q is a non-commutative ring without
unity with respect to addition and multiplication
of matrices.

15. Let R be a ring with identity. Then prove that
every ideal I ≠ R is contained in a maximal ideal.

16. Let I, J be ideals of rings R with J ⊆ I. Then
prove that \( R/I \cong \frac{(R/J)}{(I/J)} \).
1. Find the sum to infinity of 
\[1 - \frac{1}{4} + \frac{1.3}{4.8} - \frac{1.3.5}{4.8.12} + \ldots + \infty.\]

2. Prove that 
\[\log_2 - \frac{1}{2!} \left(\log_2\right)^2 + \frac{1}{3!} \left(\log_2\right)^3 - \ldots = \frac{1}{2}.\]

3. Solve: 
\[x^3 - 19x^2 + 114x - 216 = 0\] given that the roots are in geometric progression.
4. If $\alpha, \beta, \gamma$ are the roots of $x^3 - 14x + 8 = 0$ find
(a) $\Sigma \alpha^2$ (b) $\Sigma \alpha^3$.

5. Remove the second term in $x^4 - 12x^3 + 48x^2 - 72x + 35 = 0$ and hence solve it.

6. Write the procedure for finding the approximate root of $f(x) = 0$ by Bisection method.

7. State Newton’s forward formula for interpolation.

8. Compute the value of the definite integral $\int_{1}^{2} \frac{dx}{x}$
using trapezoidal rule by taking the range of integral as 5 equal parts.

SECTION B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. Show that $\frac{15}{16} + \frac{15 \cdot 21}{16 \cdot 24} + \frac{15 \cdot 21 \cdot 27}{16 \cdot 24 \cdot 32} + \ldots \infty = \frac{47}{9}$.

10. Increase by 2 the roots of $x^4 - x^3 - 10x^2 + 4x + 24 = 0$ and hence solve the resultant equation.

11. Solve $6x^5 + 11x^4 - 33x^3 - 33x^2 + 11x + 6 = 0$.
12. Find the positive root of $2x^3 - 3x - 6 = 0$ by Newton’s Raphson method correct to 3 decimal places.

13. Use Lagrange’s interpolation formula to find the value of $u_4$ of a function $u_x$, given that $u_1 = 10$, $u_2 = 15$ $u_5 = 42$.

\[ x: \quad 1 \quad 2 \quad 5 \]
\[ f(x): \quad 10 \quad 15 \quad 42 \]

14. Find the approximate value of the root of the equation $x^3 + x - 1 = 0$ using the method of false position correct to two decimal places.

15. From the following table of values $x$ and $y$ obtain $\frac{dy}{dx}$ at 1.2

\[ x: \quad 1.0 \quad 1.2 \quad 1.4 \quad 1.6 \quad 1.8 \quad 2.0 \quad 2.2 \]
\[ y: \quad 2.72 \quad 3.32 \quad 4.06 \quad 4.96 \quad 6.05 \quad 7.39 \quad 9.02 \]

16. Suppose the following data were obtained from an experiment.

\[ x: \quad 3.0 \quad 3.25 \quad 3.50 \quad 3.75 \quad 4.0 \quad 4.25 \quad 4.50 \quad 4.75 \quad 5.0 \]
\[ y: \quad 6.7 \quad 7.4 \quad 8.2 \quad 9.2 \quad 10.4 \quad 11.6 \quad 12.5 \quad 13.3 \quad 14.0 \]

Use Simpson’s $1/3\text{rd}$ rule to approximate $\int_{3}^{5} y \, dx$. 
1. Explain about switch statement.

2. Write a program in C to find the area of a square.

3. Write a short note on string handling functions in C.

4. Define structures and unions in C.

5. What are the types of operators used in C-language?

6. Explain while loop.
7. Define scanf() and printf() functions in C.
8. Write a C-program to calculate simple interest.

SECTION B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. Write a C-program to convert Centigrade to Fahrenheit.
10. Write a note on the concept of pointers in C.
11. Write a C-program to find the biggest number among three numbers.
12. Write a brief note on if–else statement with example.
13. Write a C-program to find the area and circumference of the circle.
14. Explain about file concept in C.
15. Explain arrays in C.
16. Explain multiple inheritance with suitable example.