

DISCRETE MATHEMATICS

Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. What are the different types of binary relations? Give an example.
2. Let $X = \{1, 2, 3, 4\}$ and a mapping $f : X \rightarrow X$ be given $f = \{(1, 2), (2, 3), (3, 4), (4, 1)\}$ form the composite function f^2, f^3 .
3. Explain the connectives conjunction and Disjunction with an example.
4. Symbolise the expression "X is the father of the mother of Y".
5. Solve the recurrence relation $H(n) = H(n-1) + 2(n-1), H(1) = 2$.
6. Find the generating function for the sequence $S(n) = b a^n$.
7. Define Digraph. Give an example.

8. Explain connected, Disconnected graphs.
9. Explain the principle of duality in lattices with an example.
10. Obtain the sum of product canonical form of the Boolean expression $X Y$.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Let $X = \{1, 2, 3, \dots\}$ and $R = \{(x, y) \mid x - y \text{ is divisible by } 3\}$ show that R is an equivalence relation.
12. Construct the truth table for $(P \rightarrow Q) \wedge R$.
13. Solve $S(k) - S(k-2) + 6S(k-3) = 0$, $S(1) = 6$, $S(2) = 22$.
14. Prove that a graph with no vertices of odd degree is Eulerian.
15. Prove that in a simple graph with n vertices is always even.
16. Write a short note on AND gate and OR gate.

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PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. State and prove Fundamental theorem on equivalence relation.
18. Using generating function solve the difference equation $Y_{n+2} - Y_{n+1} - 6Y_n = 0$ given that $Y_0 = 1$, $Y_1 = 2$.
19. Simplify the Boolean function $F(w, x, y, z) = \Sigma(0, 1, 2, 4, 5, 6, 8, 12, 14)$.

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