

5217/A21

MAY 2011

DISCRETE MATHEMATICS

Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Give an example of a relation which is reflexive, symmetric but not transitive.
2. Show that $f(x, y) = x^y$ is a primitive recursive function.
3. Distinguish tautology and contradiction.
4. Write the disjunctive normal form of $P \wedge (P \rightarrow Q)$.
5. Define recurrence relation with example.
6. Write any two properties of generating functions.
7. Define isomorphism of graphs with example.
8. Explain any types of diagrams.
9. State and prove modular inequality.
10. Write short note on Boolean functions.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Write and explain the properties of relation with example.

12. Construct truth table for the formula.

$$(P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge Q) \vee (\neg P \wedge \neg Q)$$

13. Prove that $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x)P(x) \wedge (\exists x)Q(x)$.

14. Prove that a tree with n vertices has $n - 1$ edges.

15. Using generating function solve $y_{n+2} - 6y_{n+1} + 5y_n = 0, y_0 = 2, y_1 = 6$.

16. Explain the applications of Boolean algebra to switching theory.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) Let R be the relation in $N \times N$ defined by $(a, b)R(c, d)$ iff $ad = bc$. Show that R is an equivalence relation.

- (b) Write the properties of functions.

18. (a) Show that

$$(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R.$$

- (b) Solve $T(K) - \neg T(K - 1) + 10T(K - 2) = 6 + 8$
 $K, T(0) = 1, T(1) = 2$.

19. (a) Explain the various types of trees.

- (b) Explain special lattices with examples.