MCA–650 MCA-10/ PGDCA-08

M.C.A./P.G.D.C.A. DEGREE/DIPLOMA EXAMINATION – JUNE 2008.

First Year/Second Semester

THEORY OF COMPUTER SCIENCE

Time : 3 hours Maximum marks : 75

Answer for 5 marks questions should not exceed 2 pages.

Answer for 10/15 marks questions should not exceed 5 pages.

PART A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

1. Define equivalence relation. Give examples.

2. If $f(x) = x + 2,\ g(x) = x - 2$ for $x \in \boldsymbol{R}$ find $f \circ g,\ g \circ f,\ f \circ f$ and $g \circ g$.

3. Construct truth table for $(P \vee Q) \vee 7P$.

4. Explain conjunctive and disjunctive normal forms.

5. What are isomorphic graphs? Explain with examples.

6. Prove that sum of degrees of all vertices of a graph is equal to twice the number of edges in the graph.

7. Explain matrix representation of graphs with examples.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

8. Let $X = \{1, 2, 3, 4\}$ and

$R = \{(x, y) / x > y\}$ be a relation on X.

Determine properties of R and also write the relation matrix.

9. Prove that transitive closure $R+$ of a relation R in a finite set X is transitive.

10. Construct truth table for the formula $(Q \wedge (P \rightarrow Q)) \rightarrow P$.

11. Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\neg M$.

12. Construct a turing machine $T = \{A, Q, X, P\}$ in which $A = \{a, b, B\}$ with states $Q = \{q_i (0 \leq i \leq n)\}$.

13. Prove that in a simple digraph $G = (V, E)$ every node lies in exactly one string component.

14. Show that in a complete binary tree the total number of edges is $(2n - 1)$ where *'n'* is number of terminal nodes.

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