

2017

Time: 3 hours

Full Marks: 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from **all** the Groups are directed.

Group – A**(Compulsory)**

1. Choose the correct answer of the following: 1x15=15

a) The truth table for $(p \vee q) \vee (p \wedge r)$ is the same as the truth table for:

i. $(p \vee q) \wedge (p \vee r)$

ii. $(p \vee q) \wedge r$

iii. $(p \vee q) \wedge (p \wedge r)$

iv. $P \vee q$

b) A graph G is called a if it is a connected acyclic graph.

i. Cyclic Graph

ii. Regular Graph

iii. Tree

iv. Not a graph

- c) The number of colours required to properly colour the vertices of every planer graph is:
- i. 2
 - ii. 3
 - iii. 4
 - iv. 5
- d) The truth table for $(p \vee q) \vee (p \wedge r)$ is the same as the truth table for:
- i. $(p \vee q) \wedge (p \vee r)$
 - ii. $(p \vee q) \wedge r$
 - iii. $p \vee q$
 - iv. $(p \wedge q) \vee p$
- e) A self-complemented, distributive lattice is called:
- i. Boolean algebra
 - ii. Modular lattice
 - iii. Complete Lattice
 - iv. Self dual lattice
- f) Breadth first search is equivalent to which of the traversal in the Binary Trees?
- i. Pre-order Traversal
 - ii. Post-order Traversal
 - iii. Level-order Traversal
 - iv. In-order Traversal
- g)is known as a greedy algorithm, because it chooses at each step the cheapest edge to add to subgraph S.
- i. Kruskal's algorithm
 - ii. Prim's algorithm

- iii. Dijkstra algorithm
 - iv. Bellman ford algorithm
- h) The Breadth first search traversal of a graph will result into:
- i. Linked List
 - ii. Tree
 - iii. Graph with back edges
 - iv. All of the mentioned
- i) In BFS, how many times a node is visited?
- i. Once
 - ii. Twice
 - iii. Equivalent to number of in-degree of the node
 - iv. None of the mentioned
- j) Transport layer aggregates data from different applications into a single stream before passing it to:
- i. Network layer
 - ii. Data link layer
 - iii. Application layer
 - iv. Physical layer
- k) Hamilton circuit problem is a special case of
- i. Travelling salesman problem
 - ii. Halting problem
 - iii. Hitting set
 - iv. None of the mentioned
- l)turns out that one can find the shortest paths from a given source to all points in a graph in the same time.
- i. Kruskal's algorithm
 - ii. Prim's algorithm

- iii. Dijkstra algorithm
 - iv. Bellman ford algorithm
- m) Let $X = \{2, 3, 6, 12, 24\}$ and \leq be the partial order defined by $X \leq Y$ if X divides Y . Number of edges in the Hasse diagram of (X, \leq) is:
- i. 3
 - ii. 4
 - iii. 5
 - iv. None of these
- n) According to Boolean algebra absorption law, which of following is correct?
- i. $x + xy = x$
 - ii. $(x + y) = xy$
 - iii. $xy + y = x$
 - iv. $x + y = y$
- o) Which of the following cannot solve Hamilton Circuit problem?
- i. DNA Computer
 - ii. Monte Carlo Algorithm
 - iii. Dynamic Programming
 - iv. None of the mentioned

Group – B

Answer any **five** questions of the following: 4x5=20

2. Prove by truth table $\neg(p \Rightarrow q) \Leftrightarrow (\neg p \vee \neg q) \wedge (p \vee q)$.
3. What is poset? Explain.

4. Let x, y, z be Boolean Variables. Use the rules of Boolean Algebra (or a truth table with Karnaugh map) to simplify the following expression.

$$(x \wedge z) \vee (y \vee (y \vee z)) \vee ((x \wedge y) \wedge z)$$

5. Difference between rooted and unrooted tree.

6. In lattice show that $a \leq b \Leftrightarrow a * b = a$

7. Draw a Hasse diagram for the lattice D_{18} consisting of the divisors of 18 with the partial order of divisibility.

8. Write breadth first search algorithm.

Group – C

Answer any **five** questions of the following:

7x5=35

9. Set $S = \{a, b, c, d, e\}$, given as $R = \{(a, a), (a, d), (b, b), (c, d), (c, e), (d, a), (e, b), (e, e)\}$. Find transitive closure using Warshall's Algorithm.

10. Find the shortest path from node 1 to all other nodes using dijkstra's algorithm.

11. What is minimum spanning trees-prim's algorithm? Explain with an example.

12. Show that the direct product of any lattices is a distributive lattice.

13. What are the different tree traversal techniques? Explain briefly.

14. Write short notes on any **two** of the following:

a) Permutation functions

b) Graph coloring

c) Eulerian paths

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