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FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2014

(CUCSS)

Computer Science

CSS 1C 01—DISCRETE MATHEMATICAL STRUCTURES

(2014 Admissions)

Time : Three Hours   Maximum : 36 Weightage

Part A

Answer **all** *questions.*
Each question carries **1 weightage.**

1. Show that $\overline{A \cup B} = A \cup B.$

2. Let p and q be propositions.

    p : Swimming at the New Jersey shore is allowed.

    q : Sharks have been spotted near the shore.

    Express each of these compound propositions in English statement.

    $P^{''} q\bullet$

    (ii) $p \leftrightarrow q.$

3. What is meant by universal quantifier ? Give example.

4. State Pigeon-hole Principle.

5. Define POSET with example.

6. Define Boolean algebra.

7. In a lattice (L,   Show that $a \wedge a = a$ and a v a = a, for all a E L.

8. Define Subgroup. Give example.

9. Give an example for a field.

10. Define r inimal spanning tree.

11. Define Euler circuit.

12. Define planar graph.

(12 x 1 = 12 weightage)

Turn over

Part B

Answer any **six** *questions.*
Each question carries **2** *weightage.*

13. Explain different connectives using in propositional logic.

14. What is meant by Normal form ? Explain with example CNF and DNF.

15. Discuss about different types of functions.

16. Explain with example matrix and digraph representation of a relation.

17. If a, *b, c* are elements of a distributive lattice (L ∧ V), Show that $a \vee b = a \vee c$ and
$a \wedge b = a \wedge c \Rightarrow b = c.$

18. Show that every chain is a Lattice.

19. Show that isomorphism of simple graphs is an equivalence relation.

20. State Prim's algorithm. Apply Prim's algorithm to find a minimal spanning tree for the weighted graph as shown in figure.
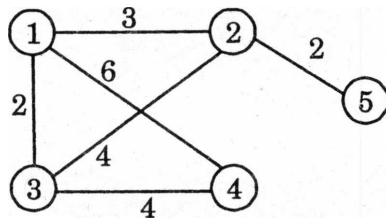
21. Prove that a tree with n vertices has n —1 edges.

(6 x 2 = 12 weightage)

Part C

Answer any **three** *questions.*
Each question carries **4** *weightage.*

22. (a) Prove that $3 x (p (x) n Q (x)) \Rightarrow (3 x) p (x) \text{ A } (3 X) Q (x).$

(b) Show that the following conditional statement is a tautology by using truth table.

$$\to q) \text{ A } (q \quad r)] \to (p \to r).$$

23. Discuss steps to construct Hasse diagram. Draw the Hasse diagram for the partial ordering

{(A,   B} on the poset P(S) where S = {a, b, c}.

24. Show that in any Boolean algebra, $(a + b)(a' + c) = ac + a'b + bc.$

25. Show that subgroup of a cyclic group is itself a cyclic group.

26. A given connected graph G is an Euler graph if and only if all vertices of G are of even degree.

27. Explain with example Dijkstra's shortest path algorithm.

(3 x 4 = 12 weightage)