D 93001 **(Pages 2)** **Name..................................**

Reg. No...............................

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2015

(CUCSS)

Computer Science

CSS 1C 01 – DISCRETE MATHEMATICAL STRUCTURE

(2014 Admission onwards)

Time : Three Hours Maximum : 36 Weightage

Part A

Answer **all** *questions.*

Each question carries 1 weightage.

1. State principle of inclusion and exclusion.
2. Let p and q be propositions :

   p : It is below freezing.

   q : It is snowing.

   Write these propositions using p and q and logical connectives.

   (i) It is below freezing but not snowing.

   (ii) If it is below freezing, it is also snowing.
3. What is meant by quantifier? What are the different types of quantifiers?
4. Define Inverse function. Let f be a function from R to R with $f(x) = x^2$. Is f invertible?
5. Define equivalence relation. Let R be a relation on the set of real numbers such that aRb if a – b is an integer. Is R an equivalence relation?
6. Prove that idempotent law is a Lattice.
7. Define Boolean function.

   Show that the identity element in group is unique.

9. Define Albelian group. Give an example.

1 Define isolated and pendant vertex. Give example.

11. Define complete bipartite graph.
12. Define spanning tree of a graph.

(12 x 1 = 12 weightage)

Turn over

Part B

Answer any **six** *questions.*

Each question carries 2 *weightage.*

13. **Explain with example different operations on a set.**

14. **Show that the following conditional statement is a tautology by using truth table :**

    $[(p \to q)\ A\ (q \to r)] \to (p \to r)$.

15. **Discuss about different normal forms.**

16. **What is Hasse diagram? Draw the Hasse diagram for the partial ordering {(A, B) / (A ⊂ B)} on the poset P (S) where S = {a, b, c).**

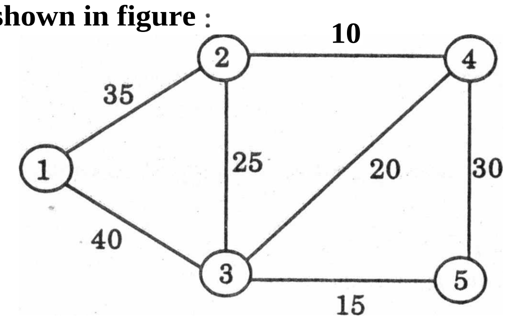
17. **Discuss with example closure of a relation.**

18. **Show that every chain is a Lattice.**

19. **Prove that in a Boolean algebra L, (a v *b)* = a A *b* and *(a n b)* = a v E. for *a, b* E L.**

20. **Explain the steps in Dijkstra's shortest path algorithm.**

21. **State Kruskal's algorithm. Apply Kruskal's algorithm to find a minimal spanning tree for the weighted graph as shown in figure :**



(6 x 2 = 12 weightage)

Part C

Answer any **three** *questions.*

Each question carries 4 *weightage.*

22. **Show that** $p\ A\ (\sim q\ A\ r))\ v\ (q\ A\ r)\ (p\ A\ r) \Leftrightarrow r$.

23. **Discuss different properties of a relation with example. How many relations are there on a set with n elements.**

24. (i) **Show that every chain is a Lattice.**

    (ii) Show that the Demorgan's law holds in a complemented distributive lattice.

25. **Prove that the subgroup H of a group G is normal iff every left coset of H is a right coset of H in G.**

26. (i) **Prove that a tree with n vertices has n – 1 edges.**

    (ii) Prove that an undirected graph has an even number of vertices of odd degree.

27. **State and prove Cayley's theorem.**

(3 x 4 = 12 weightage)