D 93395 **(Pages : 4)** **Name..................................**

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

FIRST SEMESTER M.Sc. (COMPUTER SCIENCE) DEGREE EXAMINATION, NOVEMBER 2020

(CBCSS)

CSS 1C 01—DISCRETE MATHEMATICAL STRUCTURES

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

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

1. Solve using set theory : Among 60 students in a class, 28 got class I in SEM I and 31 got class I in SEM II. If 20 students did not get class I in either Semesters, how many students got class I in both the Semesters ?
2. Define Well Formed Formula. Give an example of a formula which is not a Well Formed formula.
3. State and explain the principle of Duality for Lattices.
4. Define Rings and Fields.
5. Define closure of a relation.
6. State Pigeon hole principle.
7. Define subgraphs, paths and circuits.

($4 \times 2 = 8$ weightage)

Section B

Answer any **four** *questions.*
Each question carries 3 weightage.

8. Define Tautology. Give an example of Tautology. Prove / disprove the following :

   (i) $(P \to Q) \wedge (R \to Q) \Leftrightarrow (P \vee R) \to Q.$

   (ii) $P \to (Q \to P) \Leftrightarrow \sim P \to (P \to Q).$

   (iii) $\sim (P \leftrightarrow Q) \Leftrightarrow (P \vee Q) \wedge \sim (P \wedge Q).$

   (iv) $\sim (P \leftrightarrow Q) \Leftrightarrow (P \wedge \sim Q) \vee (\sim P \wedge Q).$

9. (i) Write the following statements in the symbolic form :

   (a) All men are bad.

   (b) No men are bad.

   (c) Some men are good.

   (d) If any one is bad Raj is bad.

   (ii) Indicate the variables that are free and bound.

   (a) $(\forall x)(P(x) \to R(x)) \to (\forall x) P(x) \wedge R(x).$

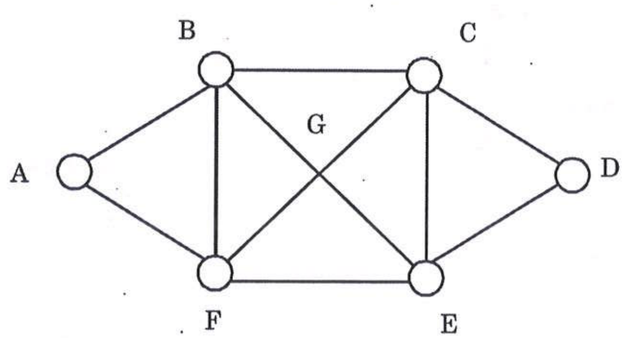
   (b) $(\forall x)(P(x) \wedge (\exists x) Q(x)) \vee ((\forall x) P(x) \to Q(x)).$

10. Define Boolean algebra. Boolean functions and Boolean expressions. Give examples.

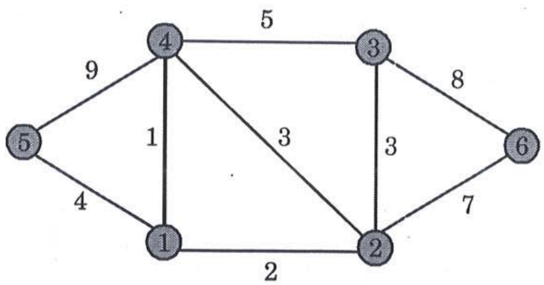
11. Write notes on Permutation Groups and Cyclic Groups.

12. Explain composition of relations with an example.

13. Define Euler path and circuits. Find Euler circuit in the following graph:



14. Find Minimum Spanning Tree using Kruskal's algorithm.



(4 × 3 = 12 weightage)

Section C

Answer any **two** *questions.*
Each question carries 5 *weightage.*

15. (i) Define Distributive Lattices and Complemented Lattices. Give examples.

    (ii) Show that a Lattice is distributive if and only if for any elements a, b and c in the Lattice, $(a \vee b) \wedge c \leq a \vee (b \wedge c)$.

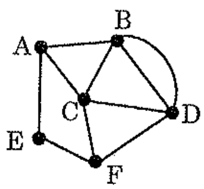
16. (i) Explain Isomorphism. Show that every group containing exactly two elements is isomorphic to $(Z_2, \oplus)$.

    (ii) Explain Monoid with example.

17. (i) Let R be a symmetric and transitive relation on a set A. Show that if for every a in A there exists b in A such that (a, b) is in R, then R is an equivalence relation,

    (ii) If $f(x) = x^2 - 4x + 2$ and $g(x) = 3x - 7$ find.

18. Identify Euler path, Euler Circuit, Hamiltonian path and Hamiltonian circuit, If exist. If not, explain the reason.



(2 × 5 = 10 weightage)