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Reg. No.....

Name.....

**M.Sc. (COMPUTER SCIENCE) DEGREE [C.S.S.] EXAMINATION  
OCTOBER 2025**

**First Semester**

MCS1C1—MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(2018 and 2015 Admissions—Mercy Chance)

Time : Three Hours

Maximum Weight : 30

**Part A**

*Answer any five questions.*

*Each question carries a weight of 1.*

1. Recall the rules of inference.
2. Define “Well-Formed Formula (WFF)”.
3. What is degree of a vertex ?
4. Write a note on weighed graphs with example.
5. What is a regular expression ?
6. State the uses of Arden’s theorem.
7. Define : “Chomsky Hierarchy”.
8. What is a crisp set ?

(5 × 1 = 5)

**Part B**

*Answer any five questions.*

*Each question carries a weight of 2.*

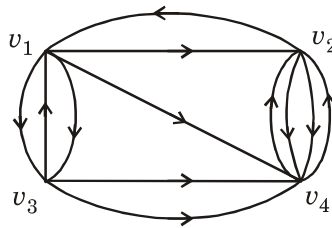
9. Distinguish between the free and bound variables.
10. Prove that the statement  $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$  is a tautology.





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11. Obtain a disjunctive normal form of  $P \rightarrow ((P \rightarrow Q) \wedge \neg(\neg Q \vee \neg P))$ .
12. Explain the concept of minimum Spanning tree algorithm with example.
13. Find the adjacency matrix of the following and also find degree of each vertices.



14. Design an NFA with  $\Sigma = \{0, 1\}$  accepts all string in which the third symbol from the right end is always 0.
15. What are the salient features of context-free languages ? Explain.
16. Highlight the characteristics of fuzzy logic.

(5 × 2 = 10)

### Part C

Answer any **three** questions.

Each question carries a weight of 5.

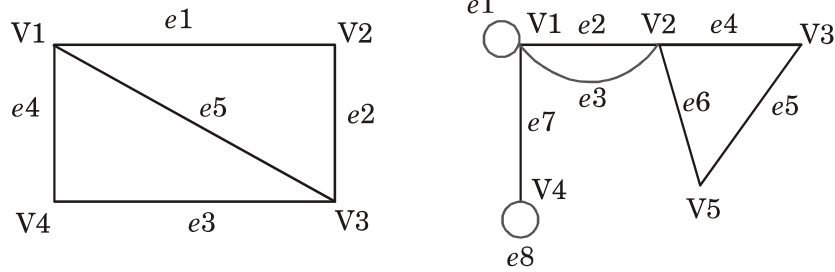
17. Prove that  $(P \rightarrow (q \rightarrow r)) \rightarrow (p \rightarrow q) \rightarrow (p \rightarrow r)$  is a tautology ?
18. Find the conjunctive normal form of  $(p \wedge \neg(q \vee r) \vee (((p \wedge q) \vee \neg r) \wedge p))$ .





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19. Find the incidence matrix of the following graph :



- 20. Construct a finite automaton that accepts exactly those input strings of 0's and 1 's that end in 11.
- 21. Construct derivation tree for a given string with example.
- 22. Determine the basic concepts of fuzzy sets with example.

(3 × 5 = 15)

