

CMR ENGINEERING COLLEGE: : HYDERABAD

UGC AUTONOMOUS

II-B.TECH-I-Semester End Examinations (Supply) – June - 2025

DISCRETE MATHEMATICS

(Common to CSE, IT & CSM)

[Time: 3 Hours]

[Max. Marks: 70]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A**(20 Marks)**

1. a) Prove that $(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$ is a tautology. [2M]
- b) State the converse, contra positive, and inverse of the below statement. [2M]
“I come to class whenever there is going to be a quiz”
- c) Compute the Symmetric closure of the relation $R=\{(1,1),(1,2),(1,3),(2,3),(3,1)\}$ defined over a set $S=\{1,2,3\}$. [2M]
- d) Let $f(x): x^2-3x+2$, find $f(x^2)$ and $f(x+3)$. [2M]
- e) State Mathematical Induction. [2M]
- f) Write a recursive algorithm for factorial. [2M]
- g) State principle of inclusion-exclusion. [2M]
- h) Define probability. [2M]
- i) Distinguish between Tree and Graph. [2M]
- j) What do you mean by chromatic number? [2M]

PART-B**(50 Marks)**

- 2.a) Show that $\sim(p \vee (\sim p \wedge q))$ and $(\sim p \wedge \sim q)$ are logically equivalent. [5M]
- b) Show that $\sim(p \wedge q), (\sim q \vee r), \sim r \Rightarrow (\sim p)$. [5M]

OR

3. Obtain principal disjunctive normal form(PDNF) for the following formula: [10M]

i) using truth table

ii) without using truth table

$$P \rightarrow [(P \rightarrow Q) \wedge \sim(\sim Q \vee \sim P)]$$

4. Let f and g be functions from R to R defined by $f(x)=ax+b, g(x)=1-x+x^2$. [10M]
If $g \circ f = 9x^2 - 9x + 3$, determine a, b .

OR

- 5.a) Define a poset. Give any two partial ordering relations. [5M]
- b) State and Explain the properties of binary relations. [5M]

- 6.a) Explain in brief the well ordering principle? [5M]
- b) Write a note on recursive Algorithms. [5M]

OR

7. Use Mathematical induction to prove that

- a) $1^2 + 2^2 + 3^2 + \dots + n^2 = (1/6)(n(n+1)(2n+1))$ [5M]

- b) $1+2+3+\dots+n=n(n+1)/2$ [5M]

8. Explain briefly about Bayes Theorem with an example. [10M]

OR

9. Define and explain a recurrence relation of n^{th} order with an example. [10M]

10. Define Isomorphism. Prove Isomorphism with example graphs. [10M]

OR

11. Explain the minimum spanning tree for the following graph using Prims algorithm: [10M]


