CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply) – December - 2025
DISCRETE MATHEMATICS
(Common to CSE, IT & CSM)

[Time: 3 Hours]   [Max. Marks: 70]

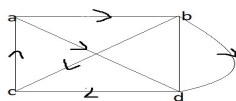**Note:** This question paper contains two parts A and B.
  Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A   (20 Marks)

1. a) State which rule of inference is the basis of the following argument: "It is below freezing now. Therefore, it is either below freezing or raining now."   [2M]
   b) Explain duality law.   [2M]
   c) If A and B, C are sets.   [2M]
      Then prove that Show that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
   d) If $f(x)=\log(x^2+1)$, $g(x)=\log x$ are pair functions, Determine whether f and g are asymptotic   [2M]
   e) Give the definitions of reflexive symmetric and anti symmetric   [2M]
   f) Define probability with example..   [2M]
   g) Find the generating function for the following sequence $1,1,1,\ldots$.   [2M]
   h) Prove that $V(X) = E((X - \mu)^2)$.   [2M]
   i) Define isomorphism in Graphs with suitable examples.   [2M]
   j) Write the path matrix for given graph.   [2M]

PART-B   (50 Marks)

2. a) Prove that n is an integer and 3n+2 is odd, then n is odd.   [5M]
   b) Show that $\neg(p \lor q)$ and $\neg p \land \neg q$ are logically equivalent.   [5M]

OR

3. Obtain PDNF and PCNF of $p \rightarrow [(p \rightarrow q) \land \neg(\neg q \lor \neg p)]$.   [10M]

4. Find the first six terms of the sequence defined by the recurrence relation with initial condition $a_n = na_{n-1} + a^2_{n-2}$, $a_0 = -1$, $a_1 = 0$.   [10M]

OR

5. Check for each of these relations on the set $\{1, 2, 3, 4\}$, whether it is equivalence or not. Also check anti symmetric.   [10M]

6. Prove by Mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer n.   [10M]

OR

7. Prove that if T is a full binary tree, then $n(T) \leq 2^{h(T)+1} - 1$ [10M]

8. State and prove Baye's Theorem.   [10M]

OR

9. Solve the recurrence relation $a_n - 7 a_{n-1} + 10 a_{n-2} = 0$ [10M]
   Where $a_0 = 10$ and $a_1 = 41$.

10. What is a Hamilton Cycle? Draw bipartite graph k3,4 and prove that this graph does not have a Hamiltonian cycle. [10M]

OR

11. Check whether the given graphs are isomorphic or not.

[10M]

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