CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply) - December- 2024
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, contrapositive and inverse of the below statement.   [2M]
      "I come to class whenever there is a quiz"
   c) Compute the Symmetric closure of the relation $R=\{(1,1),(1,2),(1,3),(2,3),(3,1)\}$ [2M]
      defined over a set $S=\{1,2,3\}$.
   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 $(gof) =9 x^2 - 9x+3$, 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) $1^2 + 2^2 + 3^2 + \ldots + n^2 = (1/6)(n(n + 1)(2n + 1))$ [5M]
   b) $1+2+3+\ldots+n=n(n+1)/2$.   [5M]

8. Explain briefly about Baye's Theorem with an example.   [10M]

   OR

9. Define recurrence relation of nth order. Solve the recurrence relation   [10M]
   $a_n - a_{n-1} - 12a_{n-2}= 0$, $a_0=0$, $a_1 = 1$.

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

OR

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

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