Code No.: DS402PC | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–II–Semester End Examinations (Supply) - February- 2023
DISCRETE MATHEMATICS
(Common to CSC, CSD)

[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) Write the converse and contrapositive of the statement: "If Pis a square, then P is a rectangle". [2M]
   b) Rewrite the following statement informally, without quantifiers or variables. $\forall x \in R$, if $x>2$ and $x^2 > 4$. [2M]
   c) Explain the transitive closure property? [2M]
   d) Explain equivalence relation. Give suitable examples for a relation which is not equivalence relation. [2M]
   e) List out the properties of an algorithm? [2M]
   f) Give an overview of Recursive Algorithms? [2M]
   g) Find the generating function for the following sequence 1,1 ,1,1,..... [2M]
   h) State principle of inclusion-exclusion. [2M]
   i) What do you mean by graph isomorphism? Give examples of isomorphic graphs. [2M]
   j) Define Euler's circuit and Give an example. [2M]

PART-B **(50 Marks)**

2.a) Show that the following premises are inconsistent. [5M]
If Jack misses many classes through illness, then he fails high school.
If Jack fails high school, then he is uneducated. If Jack reads a lot of books, then he is not uneducated. Jack misses many classes through illness and reads a lot of books.
   b) Show that $\neg P \rightarrow \neg Q \Leftrightarrow Q \rightarrow P$ through Truth Table construction. [5M]

OR

3. Symbolize the following argument and check for its validity: [10M]
All men are Mortal
Socrates is a man
Therefore, Socrates is a Mortal.

4.a) List out the properties of binary relations. Explain? [5M]

b) Draw the Hasse diagram for the divisibility on the set {1,2,3,6,12,24,36,48,96}. [5M]

OR

5.a) If R and S are equivalence relations on a set A. Prove that R∩S is an equivalence relation. [5M]

b) Discuss about representation of relations? [5M]

6.a) Give an overview of Growth of Functions in Algorithms. [5M]

b) Prove that $2^n > n$ for all positive integers n using Mathematical Induction. [5M]

OR

7.a) In what way a time complexity differs from space complexity. Explain? [5M]

b) For every positive integer n, prove that $7^n - 3^n$ is divisible by 4 using Mathematical Induction. [5M]

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

OR

9. Solve recurrence relation $a_n = 3a_{n-1} - 2a_{n-2}$, for $n \geq 2$ using generating functions? [10M]

10.a) Discuss about representation of graphs? [5M]

b) State and explain graph coloring problem. Give its applications. [5M]

OR

11. What is a Hamiltonian Cycle? Draw bipartite graph K3,4 and prove that this graph does not have a Hamiltonian cycle. [10M]

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