CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
I–M.TECH–I–Semester End Examinations (Regular) - March- 2024
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(CSE)

[Time: 3 Hours]   [Max. Marks: 60]

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 10 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   (10 Marks)

1. a) Represent the proposition "If you have the flee then you miss the final examination" into symbolic form and also it negation. **[1M]**
   b) Explain Connectives with suitable example. **[1M]**
   c) Define the power set of a set S. **[1M]**
   d) Define equivalence relation with example? **[1M]**
   e) Illustrate the properties of algorithms. **[1M]**
   f) Give a big-O estimate of the product of the first n odd positive integers. **[1M]**
   g) State applications of generating functions? **[1M]**
   h) What is recurrence relation and give an example? **[1M]**
   i) Define Isomorphism in Graphs with suitable example. **[1M]**
   j) Define a tree. **[1M]**

PART-B   (50 Marks)

2. a) Express the statement "Everyone has exactly one best friend" as a logical expression involving predicates, quantifiers with a domain consisting of all people, and logical connectives. **[10M]**
   b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises. $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\neg M$

OR

3. a) Prove or disprove the validity of the following arguments using the rules of inference. i) All men are mortal ii) All kings are men iii) Therefore, all kings are mortal. **[10M]**
   b) Give a direct proof of the theorem "If n is an odd integer, then n^2 is odd."

4. a) If A,B and C are any three sets then prove that (i) $A \cup (B - A) = A \cup B$ (ii) $A - (B \cup C) = (A - B) \cap (A - C)$. **[10M]**
   b) Give an example of a function from the set of positive integers to the set of positive integers that is one-to-one but not onto.

OR

5. a) Let X = {1, 2, 3, 4, 5, 6, 7, 8, 9} and R= {(x,y)/ x+y is divisible by 4} in X. show that R is an Equivalence Relation? **[10M]**
   b) Let A={1,2} and B={p,q,r,s} and let R be a relation from A to B defined by R={(1,q),(1,r),(2,p),(2,q),(2,s)} Find the matrix and digraph of R.

6. List all the steps used to search for 9 in the sequence 1, 3, 4, 5, 6, 8, 9, and 11 using   [10M]
   a) Linear search.
   b) Binary search.

<div align="center">OR</div>

7. a) Outline the usage of strong induction in computational geometry.   [10M]
   b) Describe a recursive algorithm for computing the greatest common divisor of two positive integers.

8. a) Discuss the principles of Inclusion – Exclusion & give its applications.   [10M]
   b) Define the expected value of a random variable X. What is the expected value of the random variable X that assigns to a roll of two dice the larger number that appears on the two dice?

<div align="center">OR</div>

9. a) Find a recurrence relation for the number of steps needed to solve the Tower of Hanoi puzzle.   [10M]
   b) Show how this recurrence relation can be solved using iteration?

10. a) Write the rules for constructing Hamiltonian paths and Circuits.   [10M]
    b) Write the difference between Hamiltonian graphs and Euler graphs?

<div align="center">OR</div>

11. a) Explain Kruskal's algorithm to find minimal spanning tree of the graph with suitable example?   [10M]
    b) Discuss about the adjacency matrix representation of graphs. Illustrate with an example.

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