Code No.: CS58102PC

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CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
I–M.TECH–I–Semester End Examinations (Regular) - March- 2023
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) For any propositions P and Q, ((P∧ (P→Q)) →Q) Is it a tautology. [1M]
   b) State Demorgon's law. [1M]
   c) How many reflexive relations are there on a set with 'n' elements? [1M]
   d) List the properties of binary relations. [1M]
   e) Suppose that f is defined recursively by f (0) = 3, f (n + 1) = 2f (n) + 3. Find f (1), f (2), f (3) and f (4). [1M]
   f) What is the worst-case complexity of the bubble sort. [1M]
   g) Let m be a positive integer. Let ak = C(m, k), for k = 0, 1, 2,...,m. What is the generating function for the sequence a0, a1,...,am? [1M]
   h) Let X be the number that comes up when a fair die is rolled. What is the expected value of X? [1M]
   i) Define cut vertex. [1M]
   j) Define chromatic number with suitable example. [1M]

PART-B **(50 Marks)**

2. Show that the truth values of the following formula is independent of its components. (P→Q) ↔ (~PVQ). [10M]

OR

3. Show that P->S can be derived from the premises ~PVQ, ~QVR, R->S. [10M]

4. Show that the relation '⊆' defined on the power set P(A) of set A is partial order relation [10M]

OR

5. Let f: R->R and g: R->R, where R is the set of real numbers. Find fog and gof, where $f(x) = x^2 - 2$ and $g(x) = x+4$. State whether these functions are injective, surjective and bijective. [10M]

6. Use mathematical induction to show that $1 + 2^1 + 2^2 + \cdots + 2^n = 2^{n+1} - 1$ for all nonnegative integers n. [10M]

OR

7. Illustrate the usage of strong induction with its principle and explain it with an appropriate example. [10M]

8. Prove that if X and Y are independent random variables on a sample space S, then $E(XY) = E(X)E(Y)$. [10M]

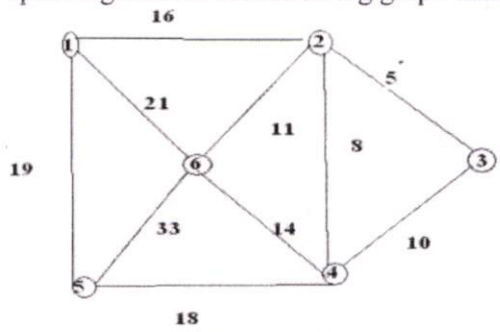
OR

9. Find all solutions of the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2} + 7^n$. [10M]

10. Explain the properties of adjacency matrix of a simple graph with suitable example? [10M]

OR

11. Construct the minimum spanning tree for the following graph using Prim's algorithm [10M]



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