Code No.: CS305PC | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: HYDERABAD
UGC AUTONOMOUS
II–B. TECH–I–Semester End Examinations (Supply) - June- 2022
DISCRETE MATHEMATICS
(Common to CSE, IT & CSM)

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

Note: 1. Answer *any FIVE questions. Each question carries 14 marks.*
2. *All questions carry equal marks.*
3. *Illustrate your answers with NEAT sketches wherever necessary.*

5X14=70

1. a) Express the statement p → q as a statement in English. Let p be the statement "Maria learns discrete mathematics." and q the statement "Maria will find a good job." [7M]
   b) Show that ¬ (p ∨ q) and (¬p∧¬q) is logically equivalent. [7M]

2. a) What is the Cartesian product of A = {I, 2} and B = {a, b, c}? [7M]
   b) Find $A^{[n]}$, if $A = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$ for all positive integers n. [7M]

3. a) Prove that mathematical induction to show that formula for the sum of a finite number of terms of a geometric progression: [7M]

$$\sum_{j=1}^{n} ar^j = a + ar + ar^2 + \ldots + ar^n = \frac{ar^{n+1} - a}{r - 1}$$

when r ≠ 1, Where n is a nonnegative integer.

   b) Find the Fibonacci numbers f_2, f_3, f_4, f_5 and f_6. [7M]

4. a) An urn contains four blue balls and five red balls. What is the probability that a ball chosen from the urn is blue? [7M]
   b) A young pair of rabbits (one of each sex) is placed on an island. A pair of rabbits does not breed until they are 2 months old. After they are 2 months old, each pair of rabbits produces another pair each month. Find a recurrence relation for the number of pairs of rabbits on the island after n months, assuming that no rabbits ever die. [7M]

5. a) Prove that an undirected graph has an even number of vertices of odd degree. [7M]
   b) Show that a full m-ary tree with i internal vertices contains n = mi + 1 vertices. [7M]

6. a) Let Q(x) be the statement "x < 2." What is the truth value of the quantification for all x Q(x), where the domain consists of all real numbers? [7M]
   b) What are the truth values of the propositions R(1, 2, 3) and R(0, 0, 1)? [7M]

7. a) If J be the function from {a, b, c, d} to {1, 2,3, 4} with J(a) = 4, J(b) = 2, J(c) = 1, and J(d) = 3. is J a bijection? [7M]

   b) How can we produce the terms of a sequence if the first 10 terms are 5,11,17,23,29,35,41, 47, 53, 59? [7M]

8. a) Describe the time complexity of the linear search algorithm. [7M]

   b) How many additions of integers and multiplications of integers are used by Algorithm 1 to multiply two n x n matrices with integer entries? [7M]

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