H.T.No. | | | | | | | | | | |

Code No: MA3511 **SRGEC-R20**

II B.Tech II Semester Regular Examinations, July 2022

DISCRETE MATHEMATICAL STRUCTURES

(Computer Science and Engineering & Artificial Intelligence and Data Science

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

Note: Answer one question from each unit.
All questions carry equal marks.

5 × 14 = 70M

UNIT-I

1. a) Explain about tautology and contradiction with truth tables. (7M)

   b) Prove that (p ∨ (q ∧r) ≡ (p ∨ q) ∧ (p ∨ r) using truth table. (7M)

(OR)

2. a) Show that the premises "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny," "If we do not go swimming, then we will take a canoe trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion "We will be home by sunset." (8M)

   b) Let p be "It is cold" and let q be "It is raining". Give a simple verbal sentence which describes each of the following statements: (a) ¬p; (b) p ∧ q; (c) p ∨ q; (d) q ∨ ¬p. (6M)

UNIT-II

3. Draw the Hasse diagram for each of the following finite posets (14M)

   (i). $(\{a|a \ is\ a\ positive\ divisor\ of\ 20\}, \leq)$ where $\leq$ denotes the divisibility relation

   (ii) $(N, \leq)$ where $\leq$ denotes the natural order relation

   (iii) $(P(S), \leq)$, S={1,2,3,4} where $\leq$ denotes the set inclusion relation

   (iv) $(P(S), \leq)$ S={1,2,3} where $\leq$ denotes the set inclusion relation

(OR)

4. a) For each of the following relations on the set {1, 2, 3, 4}, decide whether it is reflexive, whether it is symmetric, whether it is anti-symmetric, and whether it is transitive.

   (i) {(2, 4), (4, 2)} (ii) {(1, 2), (2, 3), (3, 4)} (8M)

   b) Let A = {a, b, c}, B = {x, y, z}, C = {r, s, t}. Let f: A → B and g: B → C be defined by: f = {(a, y)(b, x), (c, y)} and g = {(x, s), (y, t), (z, r)}.

   Find: (i) composition function g∘f: A → C; (ii) Im(f), Im(g), Im(g∘f). (6M)

UNIT-III

5. a) Verify that R-{-1} of real numbers other than -1 is an abelian group with respect to the operation * defined by $a * b = a + b + ab$. (8M)

   b) Is the set of all even natural numbers a group under multiplication? Justify. (6M)

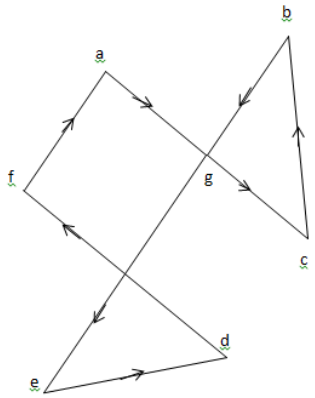
(OR)

6. a) Show that the set of all positive rational numbers forms an abelian group under the composition defined by $a * b = \frac{ab}{3}$. (8M)

b) Show that the cube root of unity forms a group and find out inverse of each element. (6M)

UNIT-IV

7. a) Define Eulerian Paths and Circuits . Show that the following Graph has Euler Circuit. (7M)



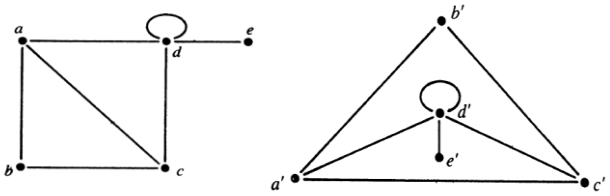
b) State Euler's formula in Graph theory. Show that K_5 is non-planar. (7M)

(OR)

8. a) Is the following sequence is degree sequence, if so find the graph

1,1,1,2,2,2,3,3,4,7. (7M)

b) Determine whether the following graphs are isomorphic or not. (7M)



UNIT-V

9. a) Solve the recurrence relation $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0, \text{given that } a_0 = 1, a_1 = 2, a_2 = 4.$ (8M)

b) Consider a group contains 213 people, then how many number of people were born in same month and in the same day. (6M)

(OR)

10. a) Solve the recurrence relation $a_n - 6a_{n-1} + 12a_{n-2} - 8a_{n-3} = 0, n \geq 3,$ given that $a_0 = 1$, $a_1 = 0$, $a_2 = 1$ using generating function. (8M)

b) Five students are participating for getting student leader in a certain college in which 587 students are there to vote them, what is the minimum number of votes needed for someone to win the student leader? (6M)

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