

[Total No. of Questions: 5]

Seat No.:

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F.Y. B.Sc. (Computer Science)
MATHEMATICS
MT - C 112: Discrete Mathematics
(2019 Pattern) (Semester - I) (Paper - II)

[Time: 2 Hours]

[Max. Marks: 35]

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn whenever necessary.*
- 5) *Use of single memory, non-programmable scientific calculator is allowed.*

Q1) Attempt any five of the following: [5]

- a) Define Disjunction with truth table.
- b) Draw the Hasse diagram D_{24} .
- c) Define transitive relation with example.
- d) Show that in a group of 8 people, there must be at least two having birthday in the same week.
- e) How many different numbers can be formed from the digits 0,2,3,4,5,6 lying between 100 & 1000 in which no digit is repeated?
- f) Find a_2 , if the sequence $\{a_n\}$ is defined by the recurrence relation
$$a_n = a_{n-2} + a_{n-1} ; a_0 = 1, a_1 = 2$$

Q2) a) How many positive integers between 1 & 1000 are divisible by [6]
i) 3 or 5 or 7?
ii) 3 & 5 but not by 7

OR

a) Draw the Hasse diagram for $(D_{42}, |)$. Also find [6]
i) Maximal & Minimal element
ii) lower bounds of 6 & 14
iii) Greatest lower bound of 14 & 42

b) Test the validity of following argument [4]
 $p \rightarrow q, q \rightarrow r \neg p \vee r$

Q3) a) Find the values of Boolean function represented by [6]

$$f(x, y, z) = (x \wedge z) \vee \bar{y}$$

OR

a) Solve the following recurrence relation. [6]

$$a_r - 6a_{r-1} + 9a_{r-2} = 0 \text{ with } a_0=1, a_1=6$$

b) Verify whether the following statement is tautology or contradiction:

$$(p \vee q) \vee \neg (p \wedge q) \quad [4]$$

Q4) a) Using Warshall's algorithm, obtain transitive closure of the relation [6]

$$R = \{(1,1), (1, 2), (2, 2), (2, 4), (3, 2), (3, 4), (4, 1), (4,2)\}$$

on the set $A = \{1, 2, 3, 4\}$.

OR

a) A class consist of 4 girls and 6 boys [6]

i) In how many ways can a committee of 5 students can be formed.

ii) In how many ways can a committee of 3 girls & 3 boys be formed?

iii) In how many ways can a committee of 5 students having at least 3 girls be formed?

b) Let R be the relation on the set $\{1,2,3,4\}$ defined by $\{xRy \text{ iff } x+y \text{ is even}\}$ draw the digraph of R. also write matrix of R. [4]

Q5) Attempt any two of the following: [5 each]

a) Let $[B, -, \vee, \wedge]$ be a Boolean algebra. for elements $a, b \in B$, prove that $\overline{a \wedge b} = \bar{a} \vee \bar{b}$

b) Solve: $a_r - 5a_{r-1} = 0$ with initial condition $a_1 = 20$.

c) How many ways are there to arrange the letters in the word "CONSTRUCTOR?"

