Seat No.:

[Total No. of Questions: 5] [Total No. of Pages: 2]

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 conjunction with truth table.

b) Draw the Hasse diagram D_{20}.

c) Define symmetric relation with example.

d) Show that in a group of 13 people, there must be at least two having birthday in the same month.

e) How many three letter sequences without repeated letters can be made using a,b,c,d,e,f in which either e or f (or both are used).

f) Find a_2, if the sequence $\{a_n\}$ is defined by the recurrence relation

$a_n = a_{n-2} + a_{n-1}$; $a_0 = 1, a_1 = 0$

Q2) a) How many positive integers between 1 & 1000 are divisible by **[6]**

i) 2 or 3 or 5?

ii) 2 & 3 but not by 5

OR

a) Draw the Hasse diagram for set S= {0,10,20,30,40} with relation R defined as 'xRy iff $x \geq y$' Also write maximal & Minimal elements **[6]**

b) Test the validity of following argument

$p \rightarrow q$, $q \rightarrow r$ $\neg p \vee r$ [4]

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

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

OR

a) Solve the following recurrence relation. **[6]**

$a_r - a_{r-1} - 6\, a_{r-2} = 0$ with $a_0=5$, $a_1= 0$

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

$(p \wedge q) \wedge - (p \vee q)$ **[4]**

Q4) a) Using Warshall's algorithm, obtain transitive closure of the relation **[6]**
R = {(1, 2), (2, 2), (2 4), (3, 2),(3, 4), (4, 1)}
on the set A = {1, 2, 3, 4}.

OR

a) A class consist of 5 girls 7 boys

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 & 2 boys be formed?

iii) In how many ways can a committee of 5 students having at least 3 girls be formed? [6]

b) Let R be the relation on the set {1,2,3,4} defined by 'xRy iff |x-y|=1' draw the digraph of R. also write matrix of R. [4]

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

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

b) Solve: $a_r = a_{r-1} + a_{r-2,}$ $a_0 = 0, a_1 = 1.$

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

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