

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**MCA– SEMESTER –III EXAMINATION –SUMMER-2019**

**Subject Code: 4639301****Date: 15-05-2019****Subject Name: Basic Mathematics****Time:02.30 pm to 5.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Define the following **07**
- (1) Intersection of two sets
  - (2) Elementary Path
  - (3) Power Set
  - (4) Modus ponens
  - (5) Partially ordered set
  - (6) Skew symmetric matrix
  - (7) Countable set
- (b)** Prove that :  $A \cap (B \cup C) \equiv (A \cap B) \cup (A \cap C)$  **07**
- Q.2 (a)** Define Tautology and Contradiction with examples. Prove that  $P \rightarrow (P \vee Q)$  is Tautology without constructing truth table. **07**
- (b)** (1) Express the following using predicates, quantifiers and logical connectives. Also verify the validity of consequence **03**  
“Every Computer science student needs to take Java Programming”
- (2) Use a truth table to determine whether the following statement form is valid: **04**
- $$x \rightarrow y$$
- $$x \rightarrow z$$
- therefore,  $x \rightarrow y \vee z$
- OR**
- (b)** Define Relation . Let  $X = \{1,2,3,4\}$  and  $R = \{ \langle x,y \rangle \mid x > y \}$ . Draw the graph of R and also give its matrix. **07**
- Q.3 (a)** Draw a flow chart to calculate  $n!$  using recursive procedure **07**
- (b)** Draw the Hasse diagrams of the following sets under the partial ordering relation “divides” and indicate those which are totally ordered. **07**
- (i)  $\{1,2,3,4\}$  (ii)  $\{3,5,15\}$  (iii)  $\{2,4,8,16\}$  (iv)  $\{1,2,3,6,12\}$  (v)  $\{2,3,6,12,24,36\}$
- OR**
- Q.3 (a)** What is relation? Give the properties of relation .Example of relation which is both symmetric and anti-symmetric. **07**
- (b)** Define Power Set. Find the Power Set of the set  $A = \{x, \{y,z\}, p\}$  **07**
- Q.4 (a)** Define Composition of a function. Let  $X = \{1,2,3\}$  and  $p, q, r$  and  $s$  be functions from  $X$  to  $X$  given by **07**
- $$p = \{ \langle 1,2 \rangle, \langle 2,3 \rangle, \langle 3,1 \rangle \}$$
- $$q = \{ \langle 1,2 \rangle, \langle 2,1 \rangle, \langle 3,3 \rangle \}$$
- $$r = \{ \langle 1,1 \rangle, \langle 2,2 \rangle, \langle 3,1 \rangle \}$$
- $$s = \{ \langle 1,1 \rangle, \langle 2,2 \rangle, \langle 3,3 \rangle \}$$
- Find  $q \circ q$  ,  $q \circ p$ ,  $p \circ q$ ,  $s \circ q$ ,  $q \circ s$ ,  $s \circ s$
- (b)** Define equivalence relation. **07**  
Let  $Z$  be the set of integers and  $R$  be the relation called “Congruence modulo 5”

defined by  $R = \{ \langle x, y \rangle \mid (x - y) \text{ is divisible by } 5 \}$  Show that  $R$  is an equivalence relation. Determine the equivalence classes generated by the elements of  $Z$ .

OR

- Q.4 (a)** Explain with example injective (onto), surjective(one-to-one) and bijective(one-to-one onto) function. Let  $N$  be set of Natural numbers including zero. Determine whether the function given below is injective, surjective or bijective. **07**

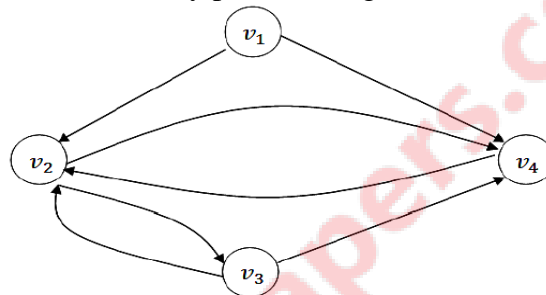
$$f : N \rightarrow N \quad f(j) = j^2 + 2$$

- (b)** Find the transpose of the matrix **07**

$$A = \begin{pmatrix} 3 & 0 & 2 \\ 2 & 0 & -2 \\ 0 & 1 & 1 \end{pmatrix}$$

- Q.5 (a)** Give other three representation of tree expressed by  $(v_0(v_1(v_2(v_3)(v_4))(v_5(v_6)(v_7)(v_8)(v_9))(v_{10}(v_{11})(v_{12})))$  obtain binary tree **07**

- (b)** Define adjacency matrix of a digraph. Obtain the adjacency matrix  $A$  of the given digraph. Find the elementary paths of lengths 1 and 2 from  $v_1$  to  $v_4$ . **07**

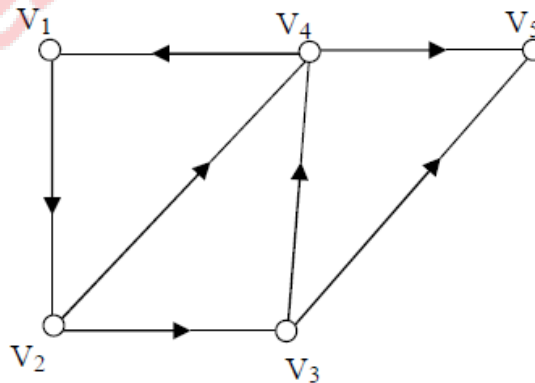


OR

- Q.5 (a)** Give an abstract definition of graph. When are two simple graphs said to be isomorphic? Give an example of two simple digraphs having 4 nodes and 4 edges which are not isomorphic. **07**

- (b)** Find all the indegrees and outdegrees of the nodes of the graph given in following figure. **07**

Give all the elementary cycles of this graph. List all the nodes which are reachable from another node of the digraph



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