

**GUJARAT TECHNOLOGICAL UNIVERSITY****MCA - SEMESTER– III EXAMINATION – WINTER 2018****Subject Code: 4639301****Date: 02-01-2019****Subject Name: Basic Mathematics****Time: 10.30 am to 1.00 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)** Give definition of the following terms: **07**
- 1) Singleton set
  - 2) Intersection of two sets
  - 3) Transpose of a Matrix
  - 4) Existential Quantifiers
  - 5) Symmetric Relation
  - 6) Complete Graph
  - 7) Pendent vertex
- (b)** (1) For  $A = \{2, 3, 4, 5, 6\}$ ,  $B = \{3, 4, 5, 6, 7\}$ ,  $C = \{4, 5, 6, 7, 8\}$  find **07**
- a)  $(A \cup B) \cap (A \cup C)$  b)  $(A \cap B) \cup (A \cap C)$
- (2) If  $A = \{2, 3\}$   $B = \{3, 4\}$   $C = \{2, 4\}$
- Find (i)  $(A \times B) \cup (A \times C)$
- (ii)  $(A \times B) \cap (A \times C)$
- Q.2 (a)**  $(p \rightarrow (q \vee r)) \wedge ((q \rightarrow p) \wedge (p \vee r))$  prepare the truth table. **07**
- (b)** Test the validity of the logical consequences: **07**
- All dogs fetch.  
Ketty does not fetch.  
Therefore, Ketty is not a dog
- OR**
- (b)** In a competition, a school awarded medals in different categories. 36 medals in dance, 12 medals in dramatics and 18 medals in music. If these medals went to a total of 45 persons and only 4 persons got medals in all the three categories, how many received medals in exactly two of these categories? **07**
- Q.3 (a)** Explain contradiction method and using it prove that  $\sqrt{6}$  is an irrational number. **07**
- (b)** Compute,  $A \vee B$ ,  $A \wedge B$ ,  $A^T$ ,  $B^T$ ,  $AB$  **07**
- $$A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
- OR**
- Q.3 (a)** Let  $X = \{1, 2, 3, 4, 5\}$   $R = \{ \langle x, y \rangle \mid x \text{ is divisible by } y \}$ . Draw a graph of R and also give its matrix. Check whether the given relation an equivalence relation? **07**
- (b)**  $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots + \frac{1}{2^n} = 1 - \frac{1}{2^n}$  **07**
- Q.4 (a)** Let  $f : R \rightarrow R$  and  $g : R \rightarrow R$  where R is the set of real numbers. Find fog and gof where  $f(x) = x^2 - 2$ ,  $g(x) = x + 4$  State whether these functions are injective, surjective, and bijective. **07**

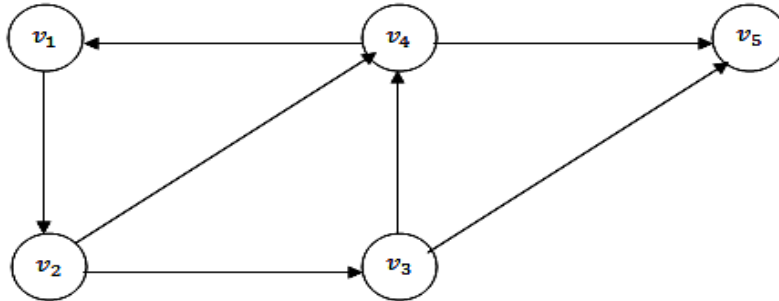
- (b) Let  $X = \{1,2,3,4,5\}$  and  $R,S,T$  be the relation as follows:  $R = \{(x,y)/x+y=5\}$  **07**  
 $S = \{(1,2),(3,4),(2,2)\}$   $T = \{(4,2),(2,5),(3,1),(1,3)\}$  (i) Write properties of  $R$ .  
(ii) Write matrix of  $R$ . (iii) Find  $S \circ T, R \circ S$  and  $S \circ R$ .

**OR**

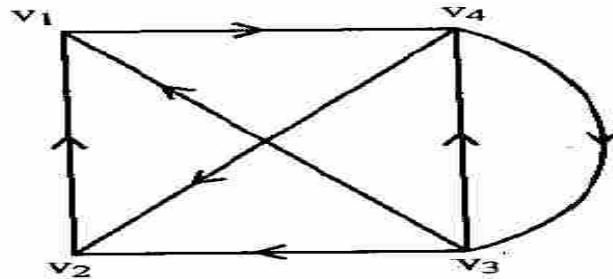
- Q.4 (a)** Define Tautology and Contradiction with examples. Prove that  $P \rightarrow (P \vee Q)$  is tautology without constructing truth table. **07**

- (b) List all possible functions from  $X = \{a,b,c\}$  to  $Y = \{0,1\}$  and indicate in each case whether the function is one-to-one, is onto, and is one-to-one onto. **07**

- Q.5 (a)** Define Strong, unilateral, weak component. Also Find Strong, unilateral, weak component from the given digraph. **07**



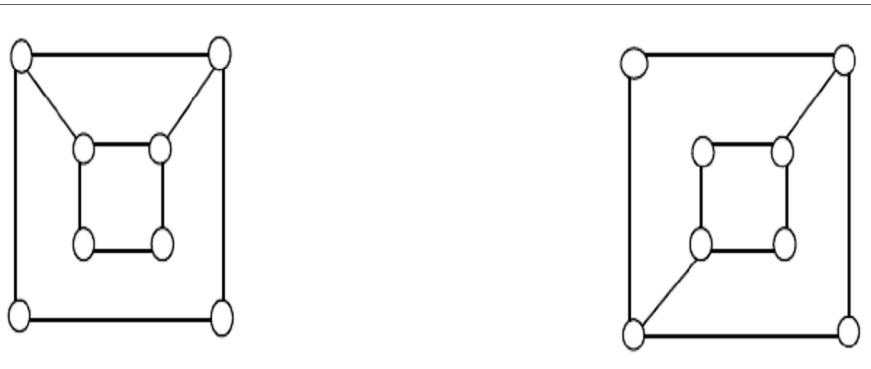
- (b) Define adjacency matrix of a graph and obtain the adjacency matrix (A) for the following graph. State the in degree and out degree of all the vertices. Find  $A^2, B_2$  and Path matrix P. **07**



**OR**

- Q.5 (a)** Define Tree. **07**  
Give three different representation of the given tree.  
 $(v_0(v_1(v_2)(v_3)(v_4))(v_5(v_6)(v_7)(v_8)(v_9))(v_{10}(v_{11})(v_{12})))$ .

- (b) Define: Isomorphic Graph. State whether the following graphs are isomorphic or not: **07**



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