

Seat No.: _____

Enrolment No. _____

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**

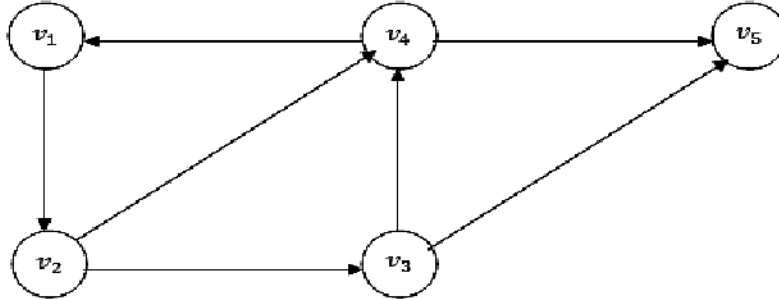
Q.4 (a) Let $f: R \rightarrow R$ and $g: R \rightarrow R$ where R is the set of real numbers. Find fog and gof where $f(x) = x^2 - 2$, $g(x) = x + 4$ State whether these functions are injective, surjective, and bijective. **07**

- (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 $S \circ R$.

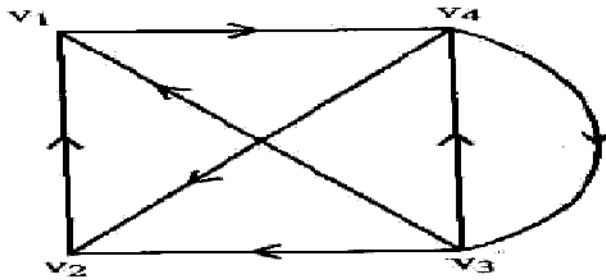
OR

- 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

