Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER– III EXAMINATION – WINTER - 2017

Subject Code: 3630001 **Date: 30-12-2017**

Subject Name: Basic Mathematics

Time: 10:30 am to 01:00 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)** Let U = {a,b,c,d,e,f,g,h,p,q,r} **07**
X = {a,b,c,d,e}
Y = {c,d,e,f,g,h}
Z = {h,p,q,r}
Compute, $X \cup Y$, $Y \cap Z \cap X$, $X-(Y \cup Z)$, $(X \cup Y)'$, X', $X' \cap Y'$, $X \Delta Y$, using Venn Diagram. (Note: $X \Delta Y = (X-Y) \cup (Y-X)$)

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

Q.2 **(a)** Let $A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ **07**
Compute, $A \vee B$, $A \wedge B$, A^T, B^T, $A \odot B$

(b) Let X = {1,2,3,4} R={<x,y> | x>y}. Draw a graph of R and also give its matrix. Check whether the given relation an equivalence relation? **07**

OR

(b) (1) Write a statement in English corresponding to the following symbolic statements: **04**
P(x) : x is integer
Q(x) : x is a rational number
R(x) : x is prime integer
1) P(5)
2) $\forall x \sim P(x)$
3) $\exists x\, R(x)$
4) $\exists x \sim Q(x)$

(2) Use a truth table to determine whether the following statement form is valid: **03**

$p \rightarrow q$
$p \rightarrow r$
therefore, $p \rightarrow q \vee r$

Q.3 **(a)** Let X={ball, bed, dog, let, egg} and let the relation R be given as: R={<x,y> | x,y $\in X \wedge$ xRy, if x and y contain some common letters.} **07**
Identify a relation. Draw a graph for R and find maximal compatibility block for the same.

(b) Let X={2,3,6,12,24,36} and the relation $\leq$ be such that $x \leq y$ if x divides y. draw the Hasse Diagram of $< X, \leq >$. **07**

OR

Q.3 **(a)** Let X={1,2,3}, f,g,h and s be function X to X given as **07**

$f = \{<1,2>, <2,3>, <3,1>\}$
$g = \{<1,2>, <2,1>, <3,3>\}$
$h = \{<1,1>, <2,2>, <3,1>\}$
$s = \{<1,1>, <2,2>, <3,3>\}$

Find $f \cdot h \cdot g$, $g \cdot s$, $s \cdot s$, $f \cdot g$, $g \cdot f$
Are functions s and f invertible?

(b) Prove that : $A \cap (B \cup C) \equiv (A \cap B) \cup (A \cap C)$ **07**

Q.4 **(a)** Show that, $n < 2^n$ **07**

(b) Draw a flow chart to calculate n! using recursive procedure. **07**

OR

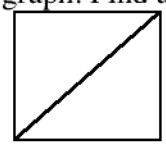
Q.4 **(a)** (1) What is a relation? Give the properties of relation with a suitable example. **04**

(2) Give example of relation which is both symmetric and anti-symmetric. **03**

Q.4 **(b)** (1) Given S = {2,a,{3},4} **05**
R = {{a}, 3, 4, 1} indicate whether the following are true or false:
1) $\{a\} \in S$
2) $\{a,4,\{3\}\} \subseteq S$
3) $R = S$
4) $\phi \in R$
5) $\phi \in \{\{3\},4\}$

(2) Give the power set of the following: {x,y,z} **02**

Q.5 **(a)** Define sub-graph. Find all sub-graphs for the given graph. **07**



(b) Draw di-graph and find in-degree and out-degree of each vertex from the given adjacency matrix. Use adjacency matrix, find total no. of path of length 1 and 2 between each vertex. **07**

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

OR

Q.5 **(a)** Define Tree. Draw a graph of tree represented by : **07**
(A(B(C(D)(E))(F(G)(H(J))))(K(L)(M(N)(P(Q)(R)))))
Obtain a binary tree corresponding to it.

(b) On a tree in the above question, perform the following traversals: **07**
1. Pre-order traversal
2. Post-order traversal
3. In-order traversal

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