Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER– I • EXAMINATION – SUMMER - 2017

Subject Code: 2610003 **Date: 16-06-2017**

Subject Name: Discrete Mathematics for Computer Science

Time:10:30 am - 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)** (1) Test the validity of the following arguments. **03**

Every integer is a rational number.
3 is an integer.
Therefore, 3 is a rational number.

(2) Let R and S be two relations on a set of positive integers. **04**

$R = \{(x,2x) / x \in I\}$
$S = \{(x,7x) / x \in I\}$
Find R o R and R o S o R.

(b) Find all sub algebra of Boolean algebra ‹ S30, Λ, V, ‘, 0, 1 ›. **07**

Q.2 **(a)** Prove that set G = {1,2,3,4,5,6} is a finite abelian group of order 6 with respect to multiplication modulo 7. **07**

(b) 1) Given a set S = {1,2,3,4,5}.Find the equivalence relation on S which generates the partition $\{\overline{1,2}, \overline{3}, \overline{4,5}\}$.Draw a graph of a relation. **04**

2) Show without constructing truth table that statement formula $\sim p \rightarrow (p \rightarrow q)$ is a tautology. **03**

OR

(b) 1) Let S= {1,2,3,4} and consider the following collections of subsets of S. **04**

Find which subsets are partitions and which subsets are covering of S.
A = {{1,2},{2,3,4}}
B = {{1,2},{3,4}}
C = {{1},{1,2}}
D = {{1,2,3},{4}}

2) In the following show that statement formula A logically implies statement formula B **03**

A : $\sim (p \rightarrow q)$ B: $p \wedge (\sim q)$

Q.3 **(a)** Prove that S_6= {1,2,3,6} is a sub lattice of $<s_{30}, D>$. **07**

(b) Give an indirect proof to show that if $n^2 + 3$ is odd, then n is even. **07**

OR

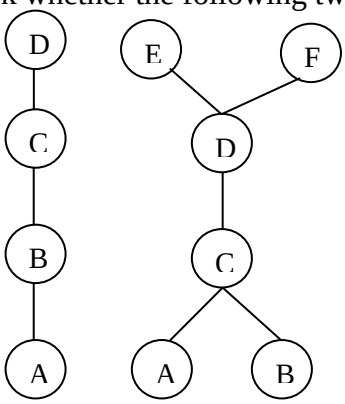
Q.3 **(a)** Draw Hasse diagram of following Posets. **07**

(1) (S_{36},D) (2) $<p(x), \subseteq>$ where x = {a,b,c}

(b) Find the complements of every element of the lattice $< S_n, D>$ for n = 45 check for complemented lattice. **07**

Q.4 **(a)** Define: Cyclic Group. Find the generator of $(Z_6, +_6)$. **07**

(b) 1) Check whether the following two posets are lattice or not. **04**



2) In any Boolean algebra show that $a = 0 \Leftrightarrow ab' + a'b = b$ **03**

OR

Q.4 **(a)** 1) Use K-map method to find a minimal SOP expression. **04**

$f(a,b,c,d) = \sum (0,1,2,3,13,15)$

2) Write the following Boolean expression in an equivalent SOP canonical form in three variables x1, x2 and x_3. **03**

$x_1 * x_2$

(b) 1) Show in a lattice if $a \leq b$ and $c \leq d$ then $a*c \leq b*d$. **04**

2) In any Boolean algebra show that $a = b \Leftrightarrow ab' + a'b = 0$ **03**

Q.5 **(a)** 1) Define Path, Out degree, Strongly connected graph , **03**

2) Symbolize the following sentences by using predicates, quantifiers and Logical connectives. **02**

(i) Either today is Monday or 7 is an integer number.

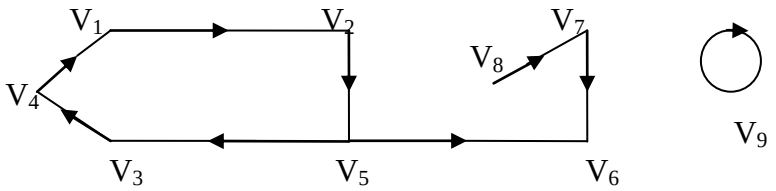
(ii) If John is in Florida, then 17 is an odd integer.

3) Construct the truth table for given statement formulas. **02**

(i) $(p \vee q) \leftrightarrow (q \rightarrow r)$

(ii) $(\sim p \vee q) \wedge p$

(b) Define node base of a simple diagraph. Find the reachability set of all nodes for the diagraph given in fig. Also find the node base for it. **07**

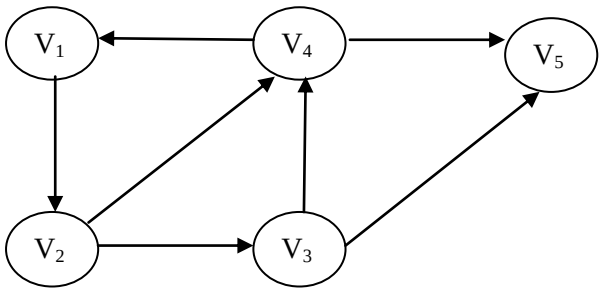


OR

Q.5 **(a)** 1) Explain Adjacency matrix of graph G with example. **04**

2)Write a short note on a directed tree **03**

(b) Find all the components of the following graph. **07**



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