

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

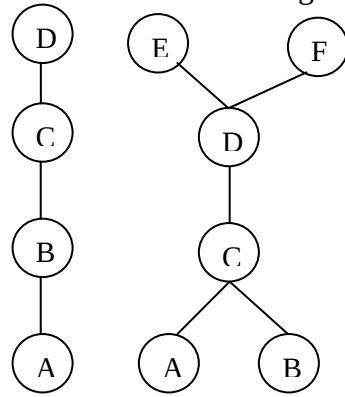
Instructions:

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 $R \circ R$ and $R \circ S \circ R$.
- (b)** Find all sub algebra of Boolean algebra $\langle S_3, \wedge, \vee, ', 0, 1 \rangle$. **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 $\langle S_3, D \rangle$. **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_3, D) (2) $\langle p(x), \subseteq \rangle$ where $x = \{a, b, c\}$
- (b)** Find the complements of every element of the lattice $\langle S_n, D \rangle$ for $n = 4, 5$ 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 x_1, x_2 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.

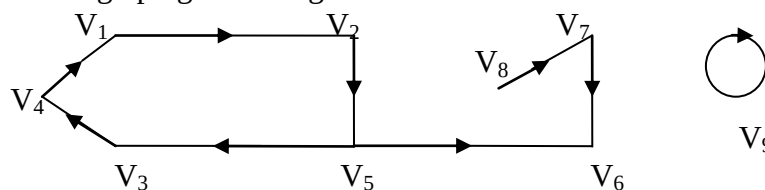
02

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

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

(b) Define node base of a simple diagram. Find the reachability set of all nodes for the diagram 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

