

M.Sc. (Part—I) Semester—II (CBCS Scheme) Examination**COMPUTER SCIENCE****(2MCS4(1) Discrete Mathematical Structures)**

Time : Three Hours]

[Maximum Marks : 80

- Note :—** (1) Illustrate your answers with the help of suitable examples/diagram wherever necessary.
 (2) Assume suitable data wherever necessary.

1. (a) Determine whether the conclusion C follows logically from the premises H_1 and H_2 :

$$(i) \quad H_1 : P \rightarrow Q \quad H_2 : \neg P \quad C : Q$$

$$(ii) \quad H_1 : P \rightarrow Q \quad H_2 : \neg(P \wedge Q) \quad C : \neg P$$

7

- (b) Construct the truth table for :

$$(i) \quad (P \rightarrow Q) \wedge (Q \rightarrow P)$$

$$(ii) \quad (P \wedge (P \rightarrow Q)) \rightarrow Q.$$

7

OR

2. (a) Show that the following are equivalent formulas :

$$(i) \quad P \vee (P \wedge Q) \Leftrightarrow P$$

$$(ii) \quad P \vee (\neg P \wedge Q) \Leftrightarrow P \vee Q.$$

8

- (b) Write formulas which are equivalent to the formulas given below and which contains the connectives $\wedge$ and $\neg$ only :

$$\neg(P \Leftrightarrow (Q \rightarrow (R \vee P))).$$

6

3. (a) Explain intersection, union and symmetric difference operation on set with example. 6

- (b) Show whether the following relations are transitive :

$$R_1 = \{(1, 1)\}$$

$$R_2 = \{(1, 2), (2, 2)\}$$

$$R_3 = \{(1, 2), (2, 3), (1, 3), (2, 1)\}.$$

7

OR

4. (a) Explain Equivalence Relation with example. 6

(b) Let $X = \{1, 2, 3\}$ and f, g, h and s be functions from X to X given by :

$$f = \{(1, 2), (2, 3), (3, 1)\}$$

$$g = \{(1, 2), (2, 1), (3, 3)\}$$

$$h = \{(1, 1), (2, 2), (3, 1)\}$$

$$s = \{(1, 1), (2, 2), (3, 3)\}$$

find $f \circ g, g \circ f, f \circ h, g \circ h, f \circ s,$

7

5. (a) Explain Associativity, Commutativity and Distributivity properties of the algebraic systems. 6

(b) Give the derivation for the string aabbcc with the language :

$$L(G) = \{a^n b^n c^n \mid n \geq 1\},$$

$$G = \langle \{S, B, C\}, \{a, b, c\}, S, \phi \rangle$$

$$S \rightarrow aSBC, \quad S \rightarrow aBC$$

$$CB \rightarrow BC, \quad aB \rightarrow ab$$

$$bB \rightarrow bb, \quad bC \rightarrow bc$$

$$aC \rightarrow cc$$

7

OR

6. (a) Explain General Structure of a typical data communication system with noise. 7

(b) Define and explain with example :

(i) Semigroups

(ii) Monoids.

6

7. (a) Obtain the product-of-sum canonical forms of the Boolean expression

$$= x_1 * x_2.$$

7

(b) Explain Lattices as partially ordered sets.

6

OR

8. (a) What is Finite State Machine ? Explain with model for Finite State Machine. 7
 (b) Explain Sub-algebra, Direct Product and Homomorphism. 6
9. (a) Show that whether the given graphs (a) and (b) are Isomorphic or not :

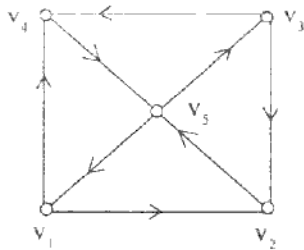


Fig. (a)

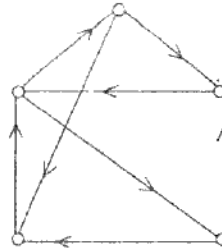


Fig. (b)

(b) Explain :

- (i) Length of Path
 (ii) Simple Path
 (iii) Cycle (Circuit).

OR

10. (a) What is Tree ? Explain. Also explain terminologies root, leaf, branch node. 7
 (b) Explain Matrix Representation of graphs by giving example. 7
11. (a) What are Turing Machines ? Explain with example. 7
 (b) Explain fault detection in combinational switching circuit. 6

OR

12. (a) What is Finite State Acceptor ? Explain. 7
 (b) Explain the algorithm for generating a fault matrix. 6

