UNIT – IV

8. (a) State and explain Kleene closure using suitable examples of your own . 8

(b) How can we convert a NFA to DFA ? 8

9. (a) What is a Moore Machine ? What is a Mealy machine ? Give two examples of both . 8

(b) Show the relation between Regular Expressions and Transition graphs. 8

Roll No. .....

67006

MCA 1st Semester (Current) CBCS Scheme w.e.f. 2016-17 Examination – December, 2018

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Paper : 16MCA-31C1

Time : Three Hours] *[Maximum Marks : 80*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Unit. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. (a) Given $A = \{1, 2, 3\}$ and $B = \{a, b\}$. Find (i) $B \times A$ and (ii) $B \times B$.

(b) Find the number of relations from $A = \{a, b, c\}$ to $B = \{1, 2\}$.

(c) Define Logical Implication.

(d) Determine truth value of following statements :

(i) $4 + 2 = 5$ and $6 + 3 = 9$

(ii) $4 + 5 = 9$ and $4 + 7 = 11$

(e) Write the dual of the statement

$$(a \wedge b) \vee a = a \wedge (b \vee a)$$

(f) Write the dual of Boolean equation $(a * 1) * (o + a') = 0$.

(g) Give two Associative laws.

(h) Prove $(a + b)' = a' * b'$. $8 \times 2 = 16$

UNIT – I

2. (a) Given A= {1, 2, 3, 4 }, draw the directed graph of relation in A : $R = \{(1,1),(2,2),(2,3),(3,2),(4,2),(4,4)\}$. Also find $R^2 = R \, o \, R$. 8

(b) Prove that if R is an equivalence relation on a set A, then R^{-1} is also an equivalence relation on A. 8

3. (a) Let W={a, b, c, d}. Determine whether each set of ordered pairs is a function from W into W. 8

(i) {(b , a), (c, d) , (d, a), (c, d) , (a, d)}

(ii) {(d, d), (c, a), (a, b), (d, b)}

(b) State and explain Lagrange's theorem. 8

UNIT – II

4. (a) Find the truth table of $\neg p \wedge q$. 8

(b) Verify that the proposition $p \vee \neg (p \wedge q)$ is tautology.

5. (a) Show that argument is a fallacy : $p \rightarrow q, \neg p \vdash \neg q$. 8

(b) State and explain De Morgan's Laws (theorems). 8

UNIT – III

6. (a) Give the dual of each statements : 8

(i) $(a \wedge b) \vee c = (b \vee c) \wedge (c \vee a)$

(ii) $(a \wedge b) \vee a = a \wedge (b \vee a)$

(b) If A and B are well ordered isomorphic sets. Prove that these is only one similarity mapping f : A $\rightarrow$ B. 8

7. (a) Let R be a ring. Let L be the collection of all ideals of R. For any ideals J and K of R, J$\vee$K = J + K and $J \wedge K = J \wedge K$. Prove that L is a bounded lattice. 8

(b) State and prove the following Boolean laws : 8

(i) Commutative

(ii) Distributive