UNIT – IV

7. (a) Describe the deterministic and non-deterministic finite automaton. How deterministic automaton differ from non-deterministic finite automaton ?

(b) Explain Moore machine with the help of example.

8. Explain the following terms with the help of example :

(a) Grammar and its types

(b) Language and Regular Expression

Roll No. .....

67011

MCA 1st Semester (With Old Notes) Examination – November, 2017

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Paper : MCA-101

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 by selecting at least ***one*** question from each Unit. All questions carry equal marks.

UNIT – I

1. (a) Define identity relation and show that the relation R on the set N × N defined by (a, b) R (c, d) iff ad = bc is an equivalence relation.

(b) Define one-one and onto function. Also find the inverse of the function $f(x) = 4x - 7, x \in R$

2. (a) Let * be a binary operation on the set Q of all non-zero rational numbers defined by a * b = 2ab / 3 for a, b ∈ Q.

(i) Is * is associative

(ii) Find the identity element in (Q, *)

(iii) Find the inverse of an element in (Q, *)

(b) Define cyclic group and coset with the help of examples.

UNIT – II

3. (a) Determine the validity of the following argument without using truth table :

"Either I will pass the examination, or I will not graduate. If I will not graduate then I will go to Canada. I failed therefore I will go to Canada".

(b) Define disjunctive normal form (dnf) and obtain the dnf of the proposition

$$p \Rightarrow [(p \Rightarrow q) \wedge \sim(\sim q \vee \sim p)]$$

4. (a) Prove that the following propositions are tautologies using truth table :

(i) $[p \wedge (p \Rightarrow q)] \Rightarrow q$

(ii) $\sim p \Rightarrow (p \Rightarrow q)$

(b) Prove by mathematical induction 1.2 + 2.3 + 3.4 + ... + $n.(n+1) = n(n+1)(n+2) / 3$.

UNIT – III

5. (a) Consider the poset A = {1, 2, 3, 4, 6, 9, 12, 18, 36}, / draw the Hasse diagram and find the greatest lower bound and least upper bound of the sets {6, 18} and {4, 6, 9}.

(b) Explain the following terms with suitable example :

(i) Lattice

(ii) Bounded Lattice

(iii) Partially ordered set

6. (a) Let B = {1, 2, 3, 4, 6, 12} be the set of positive factors of 12. Two binary operations '+' and'.' are defined as follows :

$a + b$ = lcm (a, b) and $a \cdot b$ = gcd(a, b) for all $a, b \in B$

A unary operation' / 'on B is defined as $a' = \frac{12}{a}$ for all $a \in B$. Show that $(B, +, ., /, 1, 12)$ is a Boolean algebra.

(b) If B is a Boolean algebra and x,y ∈ B, then show that $(x + y) + (x'.y') = 1$.