(b) Let $(P, \leq)$ be a distributive lattice, show that if $a \wedge x = a \wedge y$ and $a \vee x = a \vee y$ for some a, then $x = y$.

UNIT – IV

8. (a) Define regular expression and write the regular expression for the following regular sets :

(i) {00, 001, 0011, 00111, ...}

(ii) Set of all strings over $\{a, b\}$ containing exactly two a's

(iii) Set of all strings over {0, 1} containing exactly 0.

(b) What is phase structured grammars ? Explain various types of phase structured grammars.

9. (a) What do you mean by deterministic finite automata ? Design a finite automata that accepts set of strings such that every string ends in 00, over an alphabet {0, 1}.

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

Roll No. .....

67006

MCA 1st Semester (Current)

CBCS Scheme w. e. f. Dec - 2016

Examination – December, 2016

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Paper : MCA-101 (C)

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*** question in all. Question No. **1** is ***compulsory*** and attempt ***four*** more questions by selecting ***one*** from each Unit. All questions carry equal marks.

1. (a) What is the difference between relation and a function ?

(b) Consider a relation R on $A = \{7, 8, 9\}$ defined by $R = \{(7, 8), (7, 9), (8, 8), (9, 8)\}$. Find the reflexive closure of R.

(c) Give truth table of conditional and bi-conditional proposition.

(d) What are quantifiers in predicate logic ?

(e) Define the term lattice.

(f) Consider a set $A = \{4, 9, 16, 36\}$. Is the relation 'divides' a partial order on A ?

(g) Define alphabet and string with the help of example.

(h) Describe in words the strings given as regular sets :

(i) $1(0)^*$

(ii) $(10)^*$

UNIT – I

2. (a) If R be a relation in the set $N \times N$, define by $(a, b)\ R\ (c, d) \Leftrightarrow a + d = b + c$ where $a, b, c, d \in N$, then prove that R is an equivalence relation.

(b) Define one-one and onto function and prove that the function $f : Q \to Q$ given by $f(x) = 3x + 5$ for all $x \in Q$ is one-one and onto.

3. (a) What is binary operations ? Discuss various properties of binary operations.

(b) State and prove Lagrange's Theorem.

UNIT – II

4. (a) What is conjunctive normal form (cnf) and disjunctive normal form (dnf) ? Give an algorithm to convert given proposition into equivalent cnf or dnf.

(b) 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, I will not go to USA. I failed : Thus I will go to USA.

5. (a) Verify that the given compound proposition is a tautology or not :

$$((p \to q) \to r) \leftrightarrow ((p \to q) \wedge (p \to r))$$

(b) Using the principle of mathematical induction, prove that $3^{2n+2} - 8n - 9$ is divisible by 64 for every positive integer n.

UNIT – III

6. (a) Let A = {2, 3, 4, 6, 8, 12, 24, 28} and $\leq$ denotes partial order of divisibility. Construct the Hasse diagram. Let B = {4, 6, 12}, find :

(i) All upper bound of B

(ii) Least upper bound of B

(iii) All lower bound of B

(iv) Greatest lower bound of B

(b) Define complemented lattice and find the complement of each element in D_{42} (i.e. positive factor of 42) under the partial order of divisibility.

7. (a) Define Boolean algebra. Establish the following relation in Boolean algebra :

$$(a + b)\,(b + c) + b\,.\,(a + c) = a\,.\,b + a\,.\,c + b$$