END TERM EXAMINATION
FIRST SEMESTER [MCA] DECEMBER-2009

Paper Code:	Subject:Discrete Mathematics
Paper Id-441	
Time : 3 Hours	Maximum Marks :60
Note: Attempt five questions including Q.1 which is compulsory. Q.1 is of 20 marks and the rest are of 10 marks each.	

Q1   (a) Let S= {a, b, φ} then find power set P(P(S)).   **(2x10=20)**
     (b) Find the number of reflexive relations that can be defined on a set A with 4 elements.
     (c) How many nodes of degree two can you find in a complete binary tree T having n leaf nodes?
     (d) Define regular grammar and give production rule for a language in {0, 1} that terminates in a string "01".
     (e) In how many ways can a party of 7 persons arrange themselves around a circular table? Also, find number or ways in which they can arrange themselves in a queue.
     (f) Prove that a bounded Poset has both least and greatest element.
     (g) Show that the proposition $(\lor (\to))$ is a tautology.
     (h) Write converse of the following statements: - I stay only if you go. My pen is RED and your car is WHITE.
     (i) Prove that a finite string belongs to a set of regular languages.
     (j) If a and b are two distinct identity elements in a group (G,*). Justify or contradict the statement.

Q2   (a) Let A= {a, b, c, d, e} and R= {(a, a), (a, b), (b, c), (c, e), (c, d), (d, e)} then compute
         (i) R^2 and   (ii) R^∞.   **(3+2)**
     (b) Prove that the relation "congruence modulo m" is an equivalence relation in the set of integers.   **(5)**

Q3   (a) Show that n^3+2n is divisible by 3.   **(5)**
     (b) Prove that sum of two rational numbers is a rational number. Using the proof show that sum of a rational number and an irrational number is an irrational number.   **(3+2)**

Q4   (a) Let L, be distributive Lattice, for any a, b, c ЄL, then show that if
         $\land = \land$ and $\lor = \lor$ then b=c.   **(5)**
     (b)   Simplify the Boolean function: $(. .) = (. . . .)$ **(5)**

Q5   (a) Without using truth table, prove De Morgan's law of addition and multiplication of Boolean variables x and y i.e.   **(3+3)**
         (i) $(x + y)' = x' \cdot y'$ (ii) $(x \cdot y)' = x' + y'$
     (b)   Prove that $\to = \neg \lor$ **(4)**

Q6   Using Prim's algorithm find minimal spanning tree from the following graph.   **(10)**
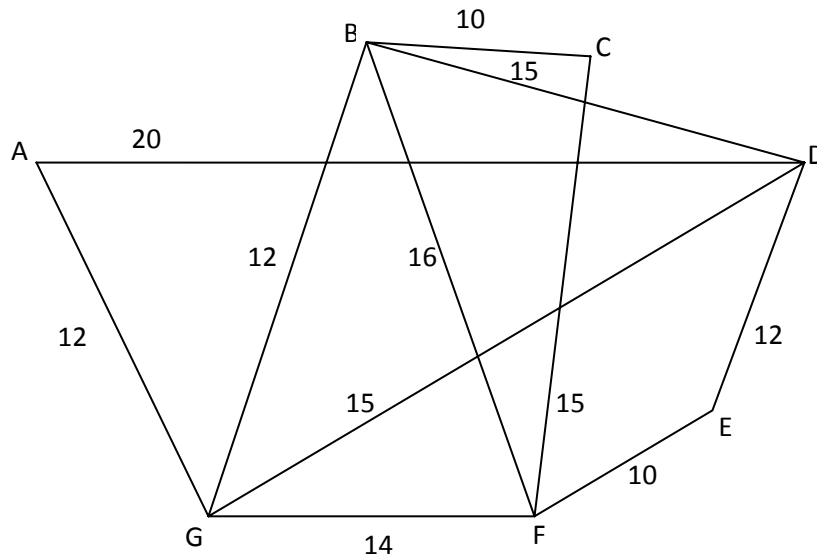
Q7 (a) Show that in a subset H of a group (G,*) if a*b⁻¹ is in H for all a, b in H, then **(5)**
H is a subgroup of G.

(b) Write a shore note on the application of group theory in computer science **(5)**
and application in context of either object oriented technology or
encryption or any other fields you think fit.

Q8 (a) State and prove pumping lemma for regular language. **(4)**

(b) Simplify the following FSM. **(6)**
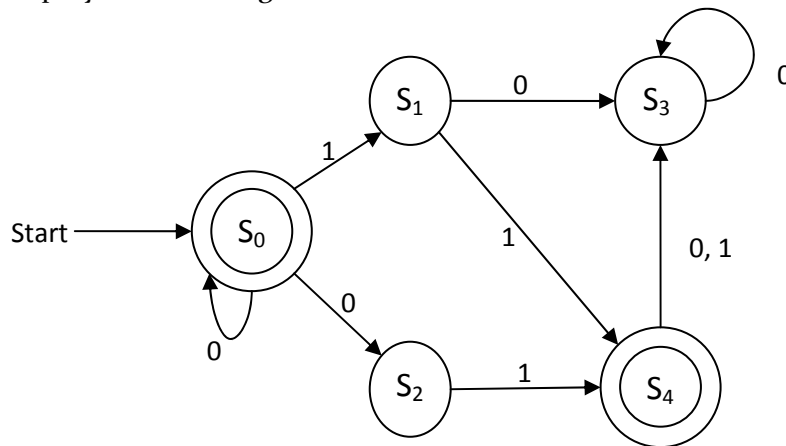
Q9 Write short notes on **any two** of the following: - **(2x5=10)**

(a) Generating function

(b) Classification of recurrence equation

(c) Isomorphic graph