

MCA - I Semester Regular Examinations, January/February 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(For 2009-10 Admitted Batches only)

Time: 3 hours

Max Marks: 60

Answer any FIVE questions
All questions carry equal marks

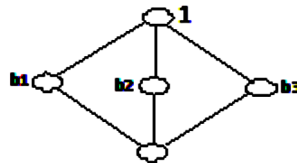
- (a) Obtain principal conjunctive normal form for,
 $(\neg P \rightarrow Q) \wedge (Q \Leftrightarrow P)$

(b) Show the following implication without using truth table.

 - $P \rightarrow Q \Rightarrow P \rightarrow (P \wedge Q)$
 - $(P \rightarrow Q) \rightarrow Q \Rightarrow (P \vee Q)$
- (a) Explain the concept of free and bound variables for predicate calculus with examples.

(b) Show that $(x)(P(x) \rightarrow Q(x)) \wedge (x)(Q(x) \rightarrow R(x)) \Rightarrow (x)(P(x) \rightarrow R(x))$
- (a) Define a poset. Let $X = \{2, 3, 6, 8\}$ and let \leq be the relation "divides" on X . Prove that $\langle X, \leq \rangle$ is a poset.

(b) Define a lattice. Show that the following lattice is not distributive.



- (a) Explain any six properties of an algebraic system.

(b) With an example, explain the concept of homomorphism and isomorphism.
- (a) If A and B are subsets of some universe set U , then $|A \cup B| = |A| + |B| - |A \cap B|$

(b) Explain the pigeon hole principle and any two applications of it.
- Solve the recurrence relation.
 $a_n - 7.a_{n-1} + 10.a_{n-2} = 0$ for $n \geq 2$
- (a) Explain different representations of graphs.

(b) What is a planar graph? Explain with an example.
- (a) When do you say that two graphs are isomorphic? Give two graphs and prove that they are isomorphic.

(b) What is a chromatic number of a given graph? With an example, explain the process of computing chromatic number of a given graph.
