

Code: 9F00104

MCA I Semester Regular & Supplementary Examinations, March 2013

**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

Time: 3 hours

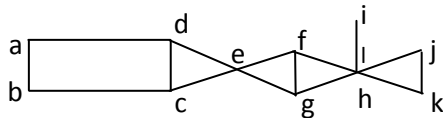
Max Marks: 60

Answer any FIVE questions  
All questions carry equal marks

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- 1 (a) Obtain the principal disjunctive normal form of  $(p \wedge q) \vee (\neg p \wedge R) (q \wedge R)$ .  
(b) Define and explain implication and Bi-implication with an example for each.
- 2 (a) Determine whether the conclusion 'C'. is valid in the following, when  $H_1, H_2, \dots$  are premises:  
(i)  $H_1 : PVQ \quad H_2, P \rightarrow R \quad H_3: Q \rightarrow R \quad C : R$ .  
(ii)  $H_1: P \rightarrow (Q \rightarrow R) \quad H_2 : R \quad C : P$ .  
(b) Discuss about free and bound variables.
- 3 (a) Let  $A = \{ 1, 2, 3, 4, 5\}$  and  $B = \{ 1, 3, 5\}$ . Let R be the relation from  $A \rightarrow B$  defined by " X is greater than Y". Write relation R, its matrix and draw its graph.  
(b) Define lattice. Explain its properties.
- 4 (a) Let  $(G, +)$  and  $(H, \Delta)$  be groups and  $g : G \rightarrow H$  be a homomorphism. Prove that Kernel of g is a normal subgroup of G.  
(b) Define group. Explain the four axioms of a group.
- 5 (a) State and prove binomial multinomial theorem.  
(b) State inclusion – exclusion principle and discuss its applications.
- 6 (a) Solve the recurrence relation:  
(i)  $d_n = 2d_{n-1} - d_{n-2}$  with initial conditions  $d_1 = 1.5$  and  $d_2 = 3$ .  
(ii)  $b_n = 3b_{n-1} - 2b_{n-2}$  with initial conditions  $b_1 = -2, b_2 = 4$ .  
(b) Define characteristics function.

- 7 Derive BFS for a tree and DFS spanning trees for the following graph



- 8 (a) Find the chromatic number of:  
(i) A bipartite graph  $K_{3,3}$ . (ii) A complete graph  $K_n$ .  
(b) Explain isomorphism of graphs with a suitable example.

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