

## II B.Tech I Semester(R05) Supplementary Examinations, December 2009

## MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

(Common to Computer Science &amp; Engineering, Information Technology and Computer Science &amp; Systems Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Compute the truth table of the further  
 $f = (x \wedge z) \vee (\neg y \vee (\neg y \wedge z)) \vee ((x \wedge \neg y) \wedge z)$   
 (b) Define tautology, contradiction and contingency of formula. [10+6]
2. (a) Let  $P(x)$  denote the statement. "x is a professional athlete" and let  $Q(x)$  denote the statement "x plays soccer". The domain is the set of all people. Write each of the following proposition in English.
  - i.  $\forall x (P(x) \rightarrow Q(x))$
  - ii.  $\exists x (P(x) \wedge Q(x))$
  - iii.  $\forall x (P(x) \vee Q(x))$
 (b) Write the negation of each of the above propositions, both in symbols and in words. [6+10]
3. (a) Draw the Hasse diagram for the poset  $(P(S), \subseteq)$  where  $S = \{1, 2, 3, 4\}$   
 (b) Define a Lattice and state its properties. [12+4]
4. (a)  $G$  is a group of positive real numbers under multiplication,  $G'$  is a group of all real numbers under addition. Let  $f \subset G \times G'$  such that  $\forall x \in G, \log_{10} x \in G'$  and  $(x, \log_{10} x) \in f$ . Show that  $f$  is an isomorphism from  $G$  to  $G'$ .  
 (b) If  $Z$  is the additive group of integers, then prove that the set of all multiples of integers by a fixed integer  $m$  is a subgroup of  $Z$ . [10+6]
5. (a) How many 10 digit binary numbers are there with exactly six 1's.  
 (b) How many binary number with 20 digit length are there with exactly 12 ones and 8 zeroes.  
 (c) How many different outcomes are possible by tossing 10 similar dice with six faces.  
 (d) How many integral solutions are there to  $x_1 + x_2 + x_3 + x_4 + x_5 = 20$  where each  $x_i > 2$ . [16]
6. (a) Solve the difference equation  $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 - 2r + 1$ .  
 (b) Solve the difference equation  $a_r - 5a_{r-1} + 6a_{r-2} = 1$ . [10+6]
7. (a) Explain about the adjacency matrix representation of graphs. Illustrate with an example.  
 (b) What are the advantages of adjacency matrix representation.  
 (c) Explain the algorithm for breadth first search traversal of a graph. [5+3+8]
8. (a) How many different Hamiltonian cycles are there in  $K_n$ , a complete graph with  $n$  vertices.  
 (b) What is the chromatic number of
  - (a) a cycle with odd number of vertices
  - (b) a tree
  - (c) a complete graph with vertices. [16]

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