

Reg. No.:

Name :

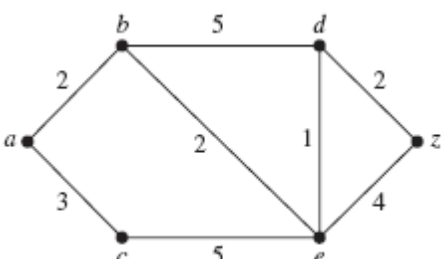


**Term End Examination – Dec 2012**

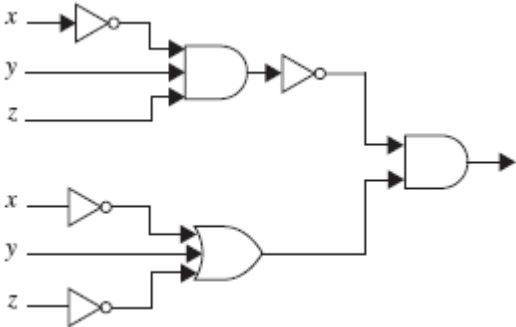
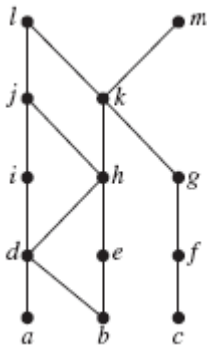
Programme	: M.Tech., (SDM)	Semester	: III & IV
Course	: Mathematical Foundation for Computer Science	Code	: MAT5
Faculty	: Dr. Hariharan	Slot	:
Time	: Three Hours	Max. Marks	: 100

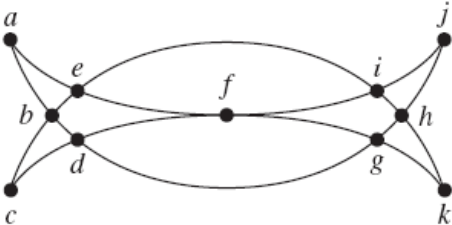
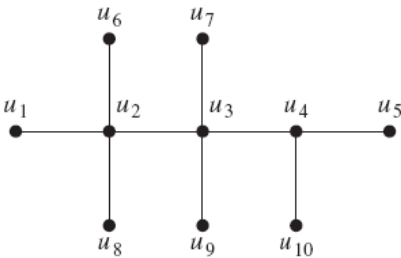
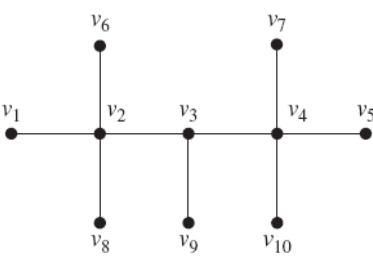
**PART – A (8 X 5 = 40 Marks)**

**Answer All Questions**

Q.No.	Sub. Sec.	Question Description	Marks
1.		Five friends have access to a chat room. Is it possible to determine who is chatting if the following information is known using consistency of premises?. Either Sachin or Rahul, or both are chatting. Either Yuvraj or Vijay, but not both are chatting. If Dhoni is chatting, so is vijay. Yuvraj and Sachin are either both chatting or neither is. If Rahul is chatting, then so are Dhoni and Sachin. Explain your reasoning.	[5]
2.		Convert the following into symbolic expression: a) Everyone in this class has a mobile phone. b) There is a person in this class who cannot swim. c) No student in this class has taken a course in Linear Algebra.	[1] [2] [2]
3.		A number when divided by 13 leaves a remainder of 11. When twice the original number is divided 12, the remainder is 8. Find the least positive value which satisfy the above conditions using Chinese Remainder Theorem?	[5]
4.		Find the value of $x$ where $5^{500} + 3^{10000} \equiv x \pmod{13}$	[5]
5.		State and prove Absorption Law using Boolean Expression.	[5]
6.		Give an example of (using Hasse diagram) a) A Bounded, Distributive Lattice which is not complemented b) A Bounded, Complemented Lattice which is not Distributive. c) A Bounded, Distributive, Complemented Lattice – A Boolean algebra	[1] [2] [2]
7.		Apply Dijkstra's theorem to find the shortest distance between the vertices $a$ and $z$ 	[5]
8.		The degree sequence of a graph is the sequence of the degrees of the vertices of the graph in non increasing order. How many edges does a graph have if its degree sequence is 5,4,3,2,2,1,1,0. Draw such a graph.	[5]

**PART – B (4 X 15 = 60 Marks)**  
**Answer any FOUR Questions**

9.	<p>a) Find the PCNF and PDNF of the expression <math>((p \rightarrow q) \rightarrow r) \wedge ((q \rightarrow r) \rightarrow s)</math>.</p> <p>b) Show that the conclusion <math>\forall x P(x) \vee \exists x Q(x)</math> follows from <math>\forall x (P(x) \vee Q(x))</math></p>	<p>[10]</p> <p>[5]</p>
10.	<p>a) If someone were to steal the royal crown, he would not be able to sell it. If a person stole the royal crown and could not sell it, he would melt it down. If someone melts down the royal crown, he will discover that it is hollow and know that the prince is a crook. Therefore, If someone steals the royal crown, then someone will know that the prince is a crook. Check the validity of the conclusion.</p> <p>b) Express <math>2^{21} - 1 = 2097151</math> as a product of prime powers.</p>	<p>[8]</p> <p>[7]</p>
11.	<p>Obtain the least positive value <math>x</math> for which</p> $x \equiv \gcd(\varphi(22), \varphi(18)) \pmod{5}, \quad x \equiv y \pmod{7}, \quad 2x \equiv 4 \pmod{18},$ <p>where <math>y</math> is the remainder when <math>5^{20}</math> is divided by 3.</p>	<p>[15]</p>
12.	<p>Use Boolean algebra to find the output of the following logic gate circuit:</p>  <p>Find the Sum-of-Product and Product-of-Sum canonical forms of the output. Use K-map and Quine-McCluskey algorithm to simplify its Sum-of-Products form.</p>	<p>[15]</p>
13.	<p>a) For the given figure, find out the following:</p>  <p>i) Is there a greatest element,</p> <p>ii) is there a least element,</p> <p>iii) Find all upper bounds of <math>\{a, b, c\}</math> and find the least upper bound, if it exist</p> <p>iv) Find the lower bounds of <math>\{f, g, h\}</math> and find the greatest lower bound, if it exist.</p>	<p>[7]</p>

	<p>b) Determine whether the following graph has an Euler Path, Euler Circuit, Hamilton Path or Hamilton Circuit?. Construct if it exists (Mention the path clearly using the given labels).</p>  <p style="text-align: center; color: blue;"><i>G</i></p>	<b>[8]</b>
14.	<p>a) Draw the binary tree of the post order expression <math>32 * 2 \uparrow 53 - 84 / * -</math>. Find the corresponding preorder and inorder expressions and also evaluate the expression.</p> <p>b) Check whether the given graphs are isomorphic or not</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>	<p><b>[8]</b></p> <p><b>[7]</b></p>

