Term End Examination, November 2011.

M.Tech., (SDM)

Course Code	**MAT5**	**Duration**	**3 hrs**
Course Name	**Mathematical Foundation for Computer Science**	**Marks**	**100**
Faculty In-charge(s)	**Dr. Hariharan**	**Slot/Batch**	**---**

PART – A (8 x 5 = 40 Marks)

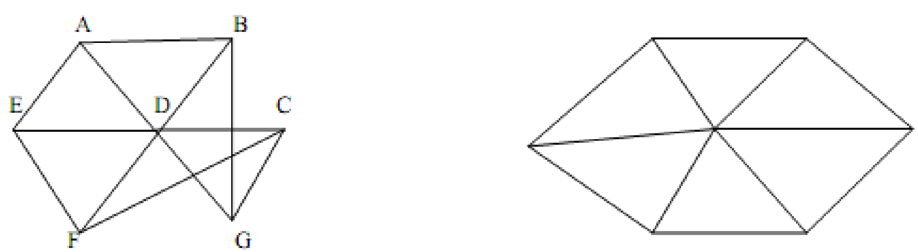
1. State and prove DeMorgan Laws in propositional calculus using truth table.

2. Write the symbolic form and prove or disprove it using quantifiers: “one student in this class knows how to write programs in JAVA” and “Everyone who knows how to write programs in JAVA can get a high paying job” imply the conclusion “Someone in this class can get a high-paying job”.

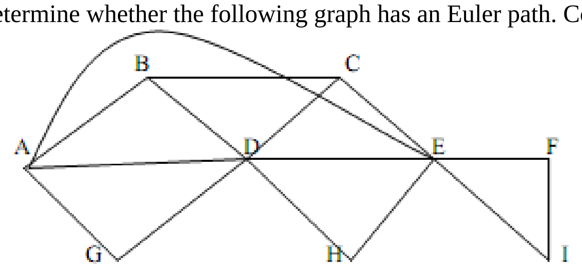
3. State and prove absorption law using Boolean expression

4. Prove that every chain is a distributive Lattice.

5. Label the following graphs and check whether they are isomorphic or not.



6. Determine whether the following graph has an Euler path. Construct such a path if it exists



7. Prove that Euler phi function value for the square of a prime number p is $\varphi(p^2) = p\,(p-1)$. Find the value $\varphi(n)$ for $n = 2700$.

8. Factor $2^{15} - 1 = 32767$.

PART – B (5 x 12 = 60 Marks)
Answer any <u>FIVE</u> Questions

9. (a) Find the PCNF and PDNF of $(P \rightarrow (Q \wedge R)) \wedge (\neg P \rightarrow (\neg Q \wedge \neg R))$ (8 marks)

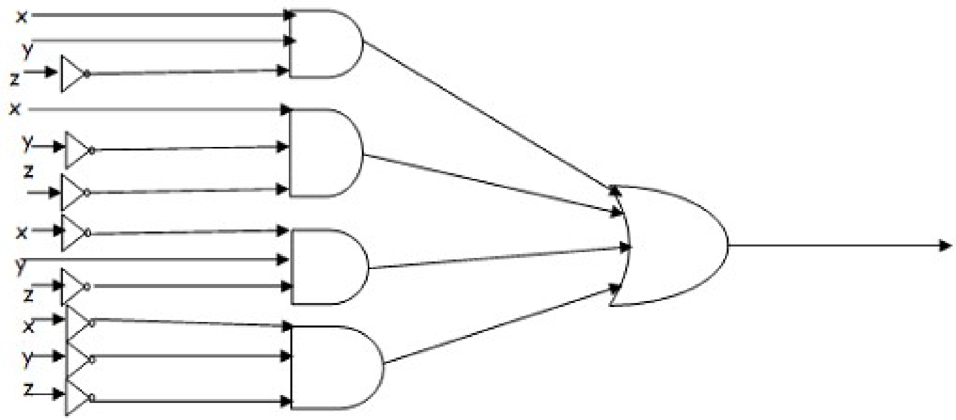
(b) Check whether the statement $(\neg P \wedge (P \rightarrow Q)) \rightarrow \neg P$ is a tautology or not. (4 marks)

10. (a) Show that the conclusion $\forall x\,(P(x) \rightarrow \neg Q(x))$ follows from the premises $\exists x(P(x) \wedge Q(x)) \rightarrow \forall y\,(R(y) \rightarrow S(y))$ and $\exists y\,(R(y) \wedge \neg S(y))$. (6 marks)

(b) Using conditional proof, prove that $P \rightarrow S$ follows from $\neg P \vee Q$, $\neg Q \vee R$ and $R \rightarrow S$ (6 marks)

11. (a) Prove that every chain is a distributive lattice (4 marks)

(b) Find the output of the following circuit and then minimize it using karnaugh maps. (8 marks)



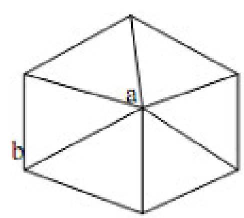
12. (a) Find the sum-of-product form of $f(x, y, z) = x + y + z$ (8 marks)

(b) Show that if every component of a graph is bipartite, then the graph is bipartite (4 marks)

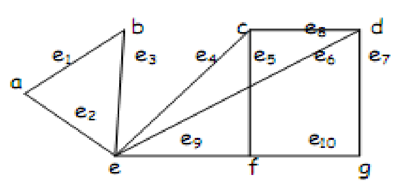
13. (a) i) Draw a 3-regular graph with 4 vertices (6 marks)

ii) Is there a simple graph with the degree sequence (2,3,3,3,3), If so, draw the graph

iii) Draw the subgraphs G–a and G–b for the following graph.



(b) Find the adjacency and incidence matrix of the following graph: (6 marks)



14. (a) **If** u and v are two vertices of a tree, show that there is a unique path connecting them. (4 marks)

(b) Find a three digit number which leaves a remainder of 4 when divided by 7, 9 or 11 (8 marks)

15. (a) Express the g.c.d(37,14) as $37x + 14y$. Use this to find x, where $14x = 5(mod\ 37)$ (6 marks)

(b) State Fermat's theorem and use it to find the value of $(5^{40} + 2^{60})(mod\ 19)$ (6 marks)