VIT UNIVERSITY
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CHENNAI CAMPUS
Vandalur - Kelambakkam Road, Chennai - 600 048.

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.

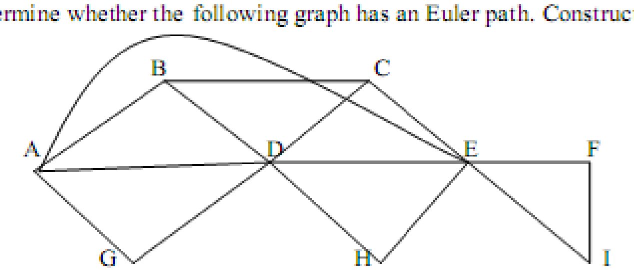
2. Write the symbolic form using quantifiers and prove or disprove the conclusion: “one student in this class knows how to write programs in JAVA” and “Everyone who knows how to write programs in JAVA can get a high paying job” imply the conclusion “Someone in this class can get a high-paying job”.

3. State and prove absorption law using Boolean expression.

4. Show that in a bounded distributive lattice, the elements which have complements form a sub lattice.

5. Prove that a graph G is a tree if and only if it is connected and has no cycles.

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 $(P\to(Q\wedge R))\wedge(\neg P\to(\neg Q\wedge\neg R))$ (8 marks)

   (b) Show that the modus ponens and modus tollens are logically equivalent (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) Let $P(x), Q(x)$ and $R(x)$ be the statements "x is a professor", "x is ignorant" and "x is vain" respectively. Express each of the following statements using quantifiers, where the universe of discourse is the set of all people.

i. No professors are ignorant

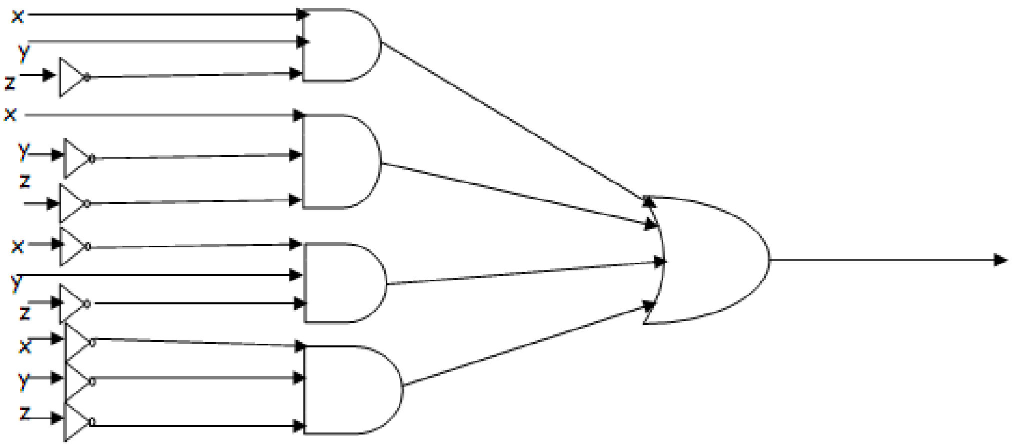
ii. All ignorant people are vain

iii. No professors are vain

iv. Does (iii) follows from (i) and (ii)? If not, is there a correct conclusion? (6 marks)

11. (a) Show that the direct product of any two distributive lattices is a distributive lattice. (4 marks)

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

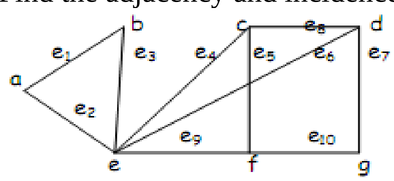


12. (a) Find the sum of product form of $f(x, y, z) = (xz)' + y + z$ (8 marks)

(b) Prove that a connected multi graph has an Euler circuit if and only if each of its vertices has even degree (4 marks)

13. (a) Prove that a complete graph with n vertices contains $n(n-1)/2$ vertices. (6 marks)

(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)