Code : 9F00104

MCA I Semester Supplementary Examinations, August 2010
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) What is a well formed formula? Give examples.
   (b) Show that $(7P\wedge(7Q\wedge R))V(Q\wedge R)V(P\wedge R)\Longleftrightarrow R$ without using truth table.
   (c) Obtain disjunctive normal form for $P\wedge(P\rightarrow Q)$.
2. (a) Prove that $(\exists x)(P(x)\wedge Q(x))\Rightarrow(\exists x)P(x)\wedge(\exists x)Q(x)$.
   (b) Explain the concept of free and bound variables for predicate calculus.
3. (a) Define equivalence relation. Prove that the relation given below is an equivalence relation.
   Let X={1,2,- - - - - - - - - - -,7} and
   R={(x,y)/x-y is divisible by 3 }.
   (b) Define a partial order relation.
   Let A= {a,b,c,d} and P(A) be power set of A. Draw Hasse diagram for $<P(A),\subseteq>$ where $\subseteq$ is inclusion relation on the elements of A.
4. (a) Define a semi group and monoid. Let S be a non empty set and P(S) be its power set. Show that $<P(S),U>$ is a monoid.
   (b) Define homomorphism for a semi group. Let X be a set containing n elements, let X^* denote the free semigroup generated by X, and let $<S,\oplus>$ be any other semigroup generated by any n generators. Prove that there exists a homomorphism g: $X^*\rightarrow S$.
5. (a) How many 2-digit or 3-digit numbers can be formed using the digits 1,3,4,5,6,8 and 9 if no repetition is allowed.
   (b) Explain the pigeon hole principle and any two applications of it.
6. (a) In $(1+x^5+x9)^{10}$ find the coefficients of x^{23} and x^{32}.
   (b) Solve the recurrence relation $a_n = c.a_{n-1}+f(n)$ for $n\geq 1$ by substitution. 'C' is a constant.
7. With suitable examples, explain BFS and DFS traversals for a graph.
8. (a) What is chromotic number? Explain the process of computing a chromatic number for a given graph.
   (b) What is a Euler circuit? Explain the process of finding a euler circuit in a given graph.

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