Code: 9F00104

MCA I Semester Supplementary Examinations August 2014

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(For students admitted in 2009, 2010, 2011, 2012 & 2013 only)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions

All questions carry equal marks

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1. (a) Write short notes on natural forms.
   (b) Show that $(\exists x)\ (P(x) \wedge Q(x)) \Rightarrow (\exists x)\ (P(x) \wedge \exists(x)\ Q(x))$ using rules of inference.

2. (a) What do you mean by proof of contradiction? Explain with a suitable example.
   (b) Show that $\overset{S}{\Rightarrow} (7Q \wedge (P \longrightarrow Q)) \longrightarrow 7P$ by using automatic theorem proving.

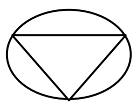
3. (a) Define lattice. Let 'n' be the +ve integer and S_n be the set of all divisors of 'n'. Let n=6 and D denotes the relations "Division", $\forall$ a,b $\in S_{6,}$ aDb iff "a divides b". Find out whether (S_6, D) is a lattice or not? Draw Hasse diagram.
   (b) Write short note on partial order relations.

4. (a) Show that the set G = {0, 1, 2, 3, 4, 5} is not a group under addition and multiplication module 6.
   (b) What is a monoid? Give three examples for a monoid.

5. (a) State and explain pigeon hole principle.
   (b) Let < R, t, · > be a ring and a,b,c be any elements of R. Prove the following:
   (i) a.(-b) = (-a).b = -(a.b)
   (ii) (-a).(-b) = a.b
   (iii) –(a+b) = (-a) + (-b)

6. (a) Find the number of integer solutions of the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 30$. Under the constraints $x_i \geq 0$ for i = 1,2,3,4,5 and further x_2 is even and x_3 is odd.
   (b) Using generating function. Solve $Y_{n+2} - 4Y_{n+1} + 3Y_n = 0$ given $Y_0 = 2$, $Y_1 = 4$.

7. (a) Write and explain the procedure of BFS algorithm.
   (b) Construct the duals of the following planar graph.



8. Explain and exhibit the following:
   (i) A graph which has both an Euler circuit and a Hamilton cycle.
   (ii) A graph which was an Euler circuit but no Hamilton cycle.
   (iii) A graph which has a Hamilton cycle but no Euler circuit.
   (iv) A graph which has neither a Hamilton cycle nor an Euler circuit.

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