Code No: R9-11-MCA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA-I Semester Regular Examinations, February 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Time: 3hours **Max.Marks:60**

Answer any Five questions
All questions carry equal marks
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1.a) Explain the following terms with suitable examples
i) Tautology ii) Contra positive
b) State and explain briefly the rules of inference.

2.a) Let the relation $R = \{(1,2),(2,3),(2,4)\}$ on the set $.\{1,2,3,4\}$ What is the transitive closure of R.
b) Let $f : R \to R$ be defined by $f(x) = 3x - 7.$ Find the value of $f^{-1} : R \to R$

3.a) Explain in detail the following algebraic systems with suitable examples:
i) Homomorphism ii) Endomorphism
b) Consider the algebraic system $(\{0,1\}, *)$, when $*$ is a multiplication operation. Determine whether $(\{0,1\}, *)$ is a semi group.

4.a) Prove $c(n,r) = c(n-1, r-1) + c(n-1, r).$
b) There are 30 girls and 35 boys in a Junior class while there are 45 girls and 30 boys in a senior class. In how many ways can a committee of 10 be chosen so that there are exactly 5 girls and 3 juniors on the committee?

5.a) How many solutions are there to the equation $x_1 + x_2 + x_3 = 17$, where x_1, x_2 and x_3 are nonnegative integers with $x_1, > 1, x_2 > 2$ *and* $x_3 > 3.$
b) Find the solution of recurrence relation $a_n = 7a_{n-1} - 16\ a_{n-2} + 12a_{n-3} + n4^n$ with $a_0 = -2\ a_1 = 0$ *and* $a_2 = 5.$

6.a) Find the generating functions for the number of integer solutions of $2w + 3x + 5y + 7z = n,\ 0 \le w, x, y, z$
b) Solve the following recurrence relation for a particular solution:
$a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = n2^n.$

7.a) Prove and disprove that there is a simple graph with degree sequence (1,1,3,3,3,5,5,6).
b) Write an algorithm for generation of breath first search spanning tree for a given graph.

8. Explain the following the terms and give suitable examples
a) Isomorphism b) Tantology c) Monoid d) Dual graph