**Code No: R06-31001-MCA**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**MCA-I Semester Regular Examinations, February 2010**
**DISCRETE STRUCTURES**

**Time: 3hours** **Max.Marks:60**

**Answer any Five questions**
**All questions carry equal marks**
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1. a) Prove the following tautology
$\{[(p \vee q) \rightarrow r] \wedge (\sim p)\} \rightarrow (q \rightarrow r)$.

b) State the converse, opposite and contra positive to the following:
i) If the triangle is equiangular, then it is equilateral.
ii) If triangle ABC is a right triangle, then $|AB|^2 + |BC|^2 = |AC|^2$.

2. a) Symbolize the following argument and check for its validities:
Lions are dangerous animals.
There are lions.
Therefore there are dangerous animals.

b) Let the universe consist of all integers and let
P(x): x is a prime.
Q(x): x is a Positive.
E(x) : x is even.
then express each of the following in symbolic form.
If x is prime , then x is positive and not even.

3. a) If A={1,2,3,4} and R={(,12),(2,3),(3,4),(4,2)} and S={(1,3),(2,4),(4,2),(4,3)} then compute R.S, S.R and $R^2$.

b) Prove by pigeon hole principle that in any group of 367 people, there must be at least one pair with the same birthday.

4. a) Show that any semi group S can be extended to a monoid by adjoining an identity element.

b) State and prove the fundamental theorem of homomorphism.

5. a) How many ways are there to pick a man and woman who are not married from 30 married couples.

b) Prove that $[c(n,0) + c(n,1) + - - - - - - + c(n,n)]^2$ =c(2n,0)+c(2n,1)+-----+c(2n,2n).

6. a) Solve the recurrence relation
$a_n - 7a_{n-1} + 10a_{n-2} = 0$ *for* $n \geq 2$.

b) Solve the recurrence relation by substitution $a_n = a_{n-1} + 3^n$ *where* $a_o = 1$.

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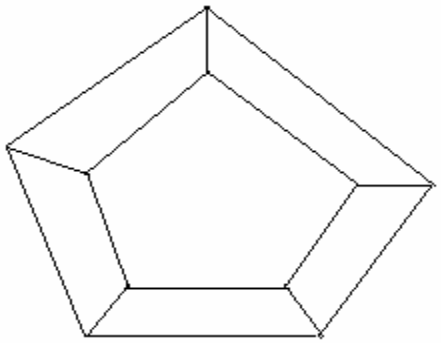
7. a) Prove the Euler's theorem for planar graphs.
   b) Write the algorithm for finding minimum spanning tree from a give n graph using Kruskal's algorithm. Give an example.

8. a) Determine whether Hamilton cycle exists or not in the following graph using Grinberg theorem.



   b) Find the chromatic number of i) $K_{3,3}$ ii) $K_{4,4}$ and iii) $K_{n,n}$.

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