Code : 06MC101

MCA I Semester Supplementary Examinations, August 2010
DISCRETE STRUCTURES

Time: 3 hours   Max Marks: 60

Answer any FIVE questions
All questions carry equal marks
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1. (a) What is statement? Give examples of statements. What are the different connectives that can be used to form formulas? Explain them.

   (b) Show that the implication $\neg(p->q)->\neg$ is a tautology.

   (c) What is principle of duality?

2. (a) What are free and bound variables? Explain them.

   (b) What is proof by contradiction? Explain it with an example.

3. (a) What is equivalence relation. If A={1,2,3,4}, give an example of relation on A that is
       i. reflexive and symmetric, but not transitive
      ii. reflexive and transitive, but not symmetric
     iii. symmetric and transitive, but not reflexive.

   (b) What is Pigeon hoe principle and what are its applications?

4. (a) Define monoid. Give an example of monoid.

   (b) Prove that under semigroup homomorphism, the properties of associativity, idempotency, and commutative are preserved.

   (c) Show that any group G is abelian iff $(ab)^2=a^2b^2$ for all a,b ε G.

5. (a) How many distinct four-digit integers can one make from the digits 1,3,3,7,7, and 8.

   (b) Determine all integer solutions to the equation $x_1+x_2+x_3+x_4=7$, where $x_i>=0$ for all l<= i <=4.

6. (a) Solve the recurrence relation a_n - $3a_{n-1}$-$5(7^n)$, where n>=1 and $a_0 = 2$.

   (b) The population of the Mumbai city is 6,000,000 at the end of the year 2000. The number of immigrants is 20,000 n at the end of the year n. The population of the city increases at the rate of 5% per year. Use a recurrence relation to determine the population of the city at the end of 2010.

7. (a) What are the different ways of representing a graph?

   (b) Write the DFS and BFS algorithms for a graph.

8. (a) Prove that for any undirected graph, the number of vertices of odd degree is even.

   (b) Define Euler Circuit. Write an algorithm for computing Euler circuit.

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