Code No: R7210502 **R7**

II B.Tech I Semester(R07) Supplementary Examinations, May/June 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to Computer Science & Engineering, Information Technology and Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Show that the principal disjunctive normal form of the formula: $P \vee (\sim P \rightarrow (Q \vee (\sim Q \rightarrow R)))$ is: $\Sigma(1, 2, 3, 4, 5, 6, 7)$.
   (b) Show that the principal conjunctive normal form of the formula: $(P \rightarrow (Q \wedge R)) \wedge (\sim P \rightarrow (\sim Q \wedge \sim R))$ is $\Pi (1, 2, 3, 4, 5, 6)$. [8+8]

2. (a) Prove the implication: $P \Rightarrow (\sim P \rightarrow Q)$ by automatic theorem.
   (b) Show that $(\forall x)(P(x) \rightarrow Q(x)) \wedge (\forall x)(Q(x) \rightarrow R(x)) \Rightarrow (\forall x)(P(x) \rightarrow R(x))$. [8+8]

3. (a) Explain the various types of functions with suitable examples.
   (b) Let the relation R = {(a, b), (a, c), (b, a), (b, c), (c, d), (d, a)} on the set {a, b, c, d}. What is the transitive closure of R? [8+8]

4. (a) What is a group? What are properties of a group? Explain them with an example each.
   (b) Show that any group G is abelian iff $(ab)^2 = a^2b^2$ for all a, b ∈ G. [8+8]

5. A mother distributes 5 different apples among 8 children:
   (a) How many ways can this be done if each child receives at most one apple?
   (b) How many ways can this be done if there is no restriction on the number of apples a child can receive? [8+8]

6. Find all solutions of the recurrence relation $a_n = -3\ a_{n-1} + 2n$. What is the solution with $a_1 = 3$. [16]

7. (a) A plane graph G is self-dual if it is isomorphic to its dual. For n=2, 3, 4, 5, fine a self-dual graph on n vertices.
   (b) Show that K_5 is planar. [6+10]

8. (a) How many non isomorphic directed simple graphs are there with 3 vertices and with 4 vertices?
   (b) Show that if g is self-Complementary simple graph with v vertices, then $v \equiv 0$ or 1 (mod 4). [8+8]

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