**Code: 9F00104**

MCA I Semester Supplementary Examinations, October/November 2013
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

Time: 3 hours                                                                                          Max Marks: 60

Answer any FIVE questions
All questions carry equal marks
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1  (a)  Show the following equivalence without constructing truth table:
       $((P \wedge Q \wedge A) \rightarrow C) \wedge (A \rightarrow (P \vee Q \vee C)) \Leftrightarrow (A \wedge (P \Leftrightarrow Q)) \rightarrow C$.
   (b)  What is a normal form? Explain different types of normal forms.

2        Test the validity of the following arguments using rules of inference.
         If I study then I will not fail in mathematics.
         If I do not play basket ball, then I will study But I fail in mathematics.
         Therefore, I must have played basket ball.

3  (a)  If A = {1, 2, 3, 4} and B = {a, b, c, d} determine if the following function are one to,
         on to or both:
         (i) f = {(1, a) (2, a) (3, b) (4, d)}
         (ii) g = {(1, c) (2, b) (3, a) (4, a)}
         (iii) h = {(1, a) (2, b) (3, a) (4, a)}.
   (b)  What is a binary relation? Explain the properties of binary relation.

4  (a)  Let G be a group and a$\in$ G. Show that
         H = {$a \cdot n / n$ is an integer} is a subgroup of G.
   (b)  Define the following:
           (i) Abelian group.  (ii) Homomorphism.

5  (a)  Five fair coins are tossed and the results are recorded. How many different
         sequence of heads and tails are possible?
   (b)  How many different ways can 'n' people be seated around a circular table?
   (c)  State Pigeon-hole principle.

6        Solve the recurrence relation,
                 $a_n - 7a_{n-1} + 26 a_{n-2} - 24 a_{n-3} = 0$ for n $\geq$ 2.

7  (a)  Write and explain prims algorithm for spanning trees.
   (b)  Explain different ways of representing a graph.

8  (a)  Write a brief note about the basic rules for constructing Hamiltonian cycles.
   (b)  Distinguish between Hamiltonian cycle and Euler cycle. Give examples.
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