D 2011 **(Pages 2)** **Name...**

Reg. No

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2009

Computer Science (Main)

CS 101—DISCRETE MATHEMATICS

(2005 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A

Answer any **five** *questions.*

1. State and prove De Morgan's law on sets.
2. Define equivalence of two formulas and prove the equivalence of following two formulas :

   (P Q), P v ~ Q.
3. State pigeonhole principle and its extension. Show that there are at least 6 different ways to choose 3 numbers from 1 to 10 so that all choices have the same sum.
4. Find the explicit formula for the recurrence relation x (n) = 4*x (n – **1)** + 5* *x* (n – 2), *x (1)* = 3, x (2) = 6.
5. (a) Show that [0, 1, 2, 3, 4) is a group under the operation "*mod5".

   (b) Find the inverse of the permutation.

   (1 2 3 4 5 6 7)

   (6 1 5 7 2 4 3)
6. Define lattice. Let (L, be a lattice in which * and + denote meet and join respectively. Show that a _ $b \Leftrightarrow a * b = a \Leftrightarrow a + b = b$.
7. Identify a finite state machine that accepts strings over *{a, b}* that begins and ends with odd number of a's.

(5 x 8 = 40 marks)

Part B

Answer any **four** *questions.*

8. (a) Prove that $\bar{\cup}_i A_i = \cap_i A$.

   (b) When is a function invertible ? Give an example.

Turn over

9. (a) Define induction. Show that $n^3 + 2n$ is divisible by 3.

(b) Write the explicit formula for Fibonacci number.

10. Define and give examples of group, subgroup, ring, coset, normal group, cyclic group, integral domain.

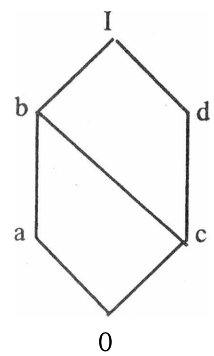
11 (a) Given the members of the poet as (1, 2), (2, 3), (3, 4) (1, 5), (5, 4), (9, 5), (5, 6), (6, 7), (8, 7). Draw Hasse diagram and find minimal and maximal elements.

(b) Verify if the Hasse diagram above is a Lattice.

12. (a) If $P \rightarrow Q$ is flase, find the truth value of ~ ~~Q) → Q.~~

(b) Define equivalence relation with an example. Find its partition.

13. (a) Verify distributive properties for the elements of the Lattice (A, as shown in the figure. Find the complement of a, b.



(b) Discuss Hamming distance.

(4 x 10 = 40 marks)