FIRST SEMESTER M.Sc. DEGREE EXAMINATION, JANUARY 2009

Computer Science (Main)

CS 101—DISCRETE MATHEMATICS

(2005 Admission)

'I   : Three Hours   . Maximum : 80 Marks

Part A

Answer **any five** *questions.*

1. Define cartesian product on sets. Show that this operation on sets is not commutative.

2. Define a binary relation and list its properties.

3. State the pigeonhole principle. Apply this principle to determine the number of keys to be issued to 100 guests to occupy 90 rooms in lodge so that each guest will have access to an unoccupied room.

4. Find the explicit formula for the recurrence relation $C(n) = -3* C(n-1) - 2* C(n-2)$, $C(1) = -2$, $C(2) = 5$.

5. Define cyclic group. Give an example. State Lagrange's theorem.

6. Draw a Hasse diagram that is also a lattice.

7. Find a finite state machine that accepts a positive integer that is multiple of 3.

(5 x 8 = 40 marks)

Part B

Answer any **four** *questions.*

8. (a) Prove that $\overline{RA,} = U_t$

    (b) Show that $f(x) = (x+1)/4$ and $g(y) = 4y - 1$ are inverses of each other.

9. (a) Show that if 8 colours are used to paint 49 scooters at least 7 will be the same colour.

    (b) What is characteristic equation ? What is its use ? Solv the linear recurrence relation :

       $a(n) = 2* a(n-1) + 3* a(n-2)$, $a(1) = 1$, $a(2) = 2$.

10. (a) Define the terms commutative group and normal subgroups. Provide examples.

    (b) What is Hamming distance ? Illustrate.

11. (a) How do you draw Hasse diagram ? Suppose $P(A)$ is the power set of $A = \{1, 2, 3\}$ and set inclusion be the relation on $P(A)$. Draw Hasse diagram of $P(A)$.

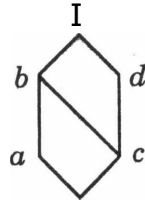   (b) Find if the Hasse diagram above is a Lattice.

Turn over

12, (a) Write the negation of the following statements :—

    (i)   It is not raining and I will not take umbrella.

    (ii) If Rajiv is not sick, then if he goes to the picnic, then he will have a good time.

    (iii) Ajay will not win the game or he will not enter the contest.

(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 c, d.

(b) Discuss Hamming distance.