Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (CSE)/SEM-1/PGCSE-101/2012-13

2012
DISCRETE STRUCTURE

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Answer any *seven* questions. $7 \times 10 = 70$

1. a) Show that the inverse a^{-1} of any element a of G is unique.

   b) Fidn the elements and the multiplication table of the symmetric group S_3.

2. a) Define subgroup with example.

   b) Let (G, 0) be a group. A non-empty subset H of G forms a subgroup of $(G, 0)$ iff

      i) $a \in h$, b not belongs to H = > $aob \in H$ and

      ii) $a \in H$ = > $a^{-1} \in H$

   c) Let $(G, 0)$ be a group. A non-empty subset H of G froms a subgroup of (G, o) if and only if

      $a \in H$, $b \in H$ = > $aob^{-1} \in H$.

3. Let A be set of n elements and B be a set of m elements.

   i) How many functions $f: A \rightarrow B$ are possible ?

   ii) How many one to one functions $f : A \rightarrow B$

4. a) There are 10 bulbs in a room each of which can be operated independently with 10 different switches. In how many ways the room can be illuminated ?

   b) Find the minimum number of students in MCA first semester to be sure that at least six will receive the same grade, if there be five possible grades A,B,C,D and F.

5. Find the closed forms of the generating functions for each of the following numeric functions :

   i) $f_r = r^2$, $r > 0$ ii) $f_r = r^3$, $r > 0$.

6. a) A commutative ring R with unity is an integral domain iff for every non-zero element a in R,

   a.u = a.v = > u = v, u,v∈R.

   b) A skew field contains no divisor of zero.

7. Define with example :

   a) Graph b) Directed graph c) Parallel edges

   d) self loop e) Null Graph.

8. a) Show that every square integer is of the form 5k or 5k ± 1 for some k ∈ Z.

   b) Show that if one of the two integers $2a + 3b$ or $9a + 5b$ is divisible by 17 then the other is also divisible by 17.