Roll Number: _____

Thapar University, Patiala
Computer Science and Engineering Department

B. Tech. (Second Year): Semester-III	Course Code: UCS405
COE MST	Course Name: Discrete Mathematical Structure
Sept 20, 2016	Tuesday
Time: 2 Hours, M. Marks: 25	Name of Faculty: Dr. Ajay Kumar, Dr. H. S. Pannu, Ms. Rajanpreet

Note: *Attempt all questions with **proper Justification**. Without Justification zero marks will be awarded. Assume missing data, if any, suitably.*

1. For $S = \{1, 2, 3, 4, 5\}$ and $C = \{\{1, 3, 5\}, \{2\}, \{4\}\}$ (3)
   Check whether C is a partition of X. If '**yes**' define an equivalence relation on S. If '**no**', give reason why C is not a partition of S.

2. Given the Hasse diagram in figure 1 of a partially ordered set (P, R) where (5)
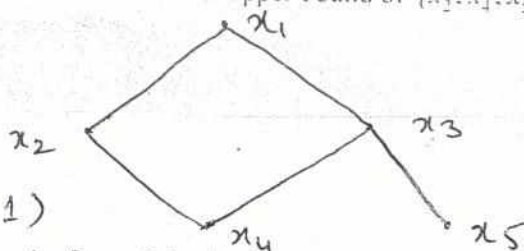 $P = \{x_1, x_2, x_3, x_4, x_5\}$.

   a) Check which of the following pairs belong to the relation:
      $x_2 R x_5,\ x_2 R x_3$
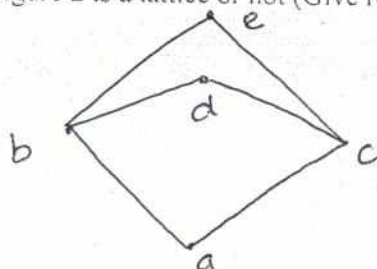   b) Find the least and greatest element in P if they exist.
   c) Find minimal and maximal element.
   d) Find greatest lower and least upper bound of $\{x_2, x_4, x_5\}$

(Figure 1)

3. Check whether the figure 2 is a lattice or not (Give reason for the same) (2)

4. a) Give a proof using membership table for the following identities. If it is not (2)
   valid then give a counter example to disprove it.
   $$A \cap (B \cup C) = (A \cup B) \cap (A \cup C)$$
   b) Check whether the following relations are irreflexive, asymmetric, anti- (3)
   symmetric or not. Give proper Justification?
   i) West (a, b): a and b are names of cities and a is in west of b.
   ii) Guest-host(a, b): a is a guest of b and b is a host of a.

5. a) Determine Theta notation of the following function (Give explanation with (3)
   each and every constant):
   [P.T.O]

$$f(x) = (x^2 + 5x + 3)(x + 2\log x)$$

b) Compute Theta notation for the following function. Assume there are no (2) errors and show each step for the computation of Theta notation:

Procedure sum (n: positive integer)

$s = 0$

$for(i = 1; i <= n; i++)$

$for(j = 1; j <= i; j++)$

$s = s + j;$

return s:

6.

a) Let R be the relation $R = \{(a, b) \mid a \text{ divides } b\}$ on the set of positive (2) integers. Find the complementary and inverse relations for R.

b) Apply Warshal's algorithm to find the transitive closure for the following directed graph. Show step by step each computation of matrices. (3) Direct answer leads to zero marks.