

Roll No. ....

**24041**

**B. Tech. 3rd Sem.**

**(Information Technology)**

**Examination – December, 2012**

**DISCRETE STRUCTURE**

**Paper : CSE-203-F**

***Time : Three Hours ]***

***[ Maximum Marks : 100***

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** Attempt *five* questions in total selecting *one* question from each of the *four* Sections. Question No. 1 is *compulsory*.

1. (a) Define power set, Cartesian product of sets, Function and inverse relation. 20
- (b) Define recurrence relation and homogeneous solution of recurrence relation with example.
- (c) Define monoid and semigroup with suitable example.

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- (d) With the help of suitable example, explain what are directed and undirected graphs.

### SECTION – A

2. Define equivalence relation, partitions, partial ordering relations and hence determine whether the relation : 20

$R = \{(a, b) \in R; a - b \leq 1 \text{ on the set of +ve integer}\}$  is

- (i) a partial order relation
- (ii) an equivalence relation
- (iii) anti-symmetric relation.

3. Prove De Morgan's laws :

(a) (i)  $(A \cup B)^c = A^c \cap B^c$  10

(ii)  $(A \cap B)^c = A^c \cup B^c$

- (b) Define tautology, contradiction, contingency and hence determine whether the following proposition is a tautology, contingency and a contradiction : 10

(i)  $p \rightarrow (p \rightarrow q)$

(ii)  $p \rightarrow (q \rightarrow p)$

(iii)  $p \wedge \sim p$

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### SECTION – B

4. (a) Solve the recurrence relation : 10

$$a_r = a_{r-1} + a_{r-2}, r \geq 2$$

with the initial conditions  $a_0 = 1$  and  $a_1 = 1$ .

- (b) Solve the recurrence relation :

$$a_{r+2} - 5a_{r+1} + 6a_r = 2 \text{ with initial condition } a_0 = 1 \\ \text{and } a_1 = -1. \quad 10$$

5. (a) With help of suitable examples define permutation, combination, AP, GP and AG series. 14

- (b) Determine the number of triangles that are formed by selecting points from a set of 15 points out of which 8 are collinear. 06

### SECTION – C

6. Explain the following terms with suitable examples : 20

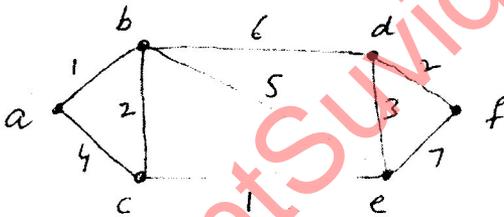
- (i) Groups
- (ii) Homomorphism in Groups
- (iii) Automorphism in Groups,
- (iv) Normal sub-group.

7. (a) State and prove Lagrange theorem. 12  
 (b) With the help of suitable examples, explain what are rings. 8

**SECTION – D**

8. Write note on (with suitable examples) : 20
- (i) Homomorphic and isomorphic graphs,
  - (ii) Cut points and bridge,
  - (iii) Multi-graphs,
  - (iv) Path and Circuit.

9. (a) Find the shortest path from a to f : 10



- (b) Explain Eulerian path and Hamiltonian path with suitable examples. 10