

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.

- (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) $p \wedge \sim p$

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

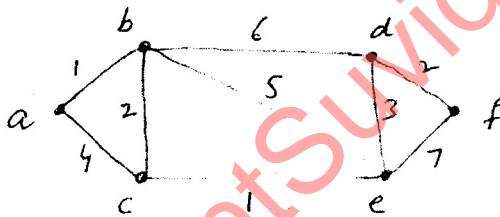
(b) With the help of suitable examples, explain what are rings. 8

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