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## II/IV B.Tech (Supplementary) DEGREE EXAMINATION

April, 2017

Common for CSE &amp; IT

Third Semester

DISCRETE MATHEMATICAL STRUCTURES

Time: Three Hours

Maximum : 60 Marks

Answer Question No.1 compulsorily.

(1X12 = 12 Marks)

Answer ONE question from each unit.

(4X12=48 Marks)

1 Answer all questions

(1X12=12 Marks)

- Define power set.
- Define the equivalence relation?
- What is the co-efficient of  $x^6$  in  $(1+x+x^2+\dots)^2$ .
- In how many ways can a committee of 7 be chosen from 11 students?
- Simplify  $A \cap (A - \bar{A}) \cup (\bar{A} - A)$ .
- Differentiate permutation and combination
- Define the chromatic number of a tree?
- Is the poset  $(Z^+, |)$  a lattice? If so justify?
- Draw the truth table of  $(\sim p) \vee \sim(\sim q)$ .
- Define Isomorphisms?
- Write the application of Recurrence Relation?
- What is difference between graph and subgraph?

## UNIT I

2 a) State the principle of mathematical induction?

4M

b) Use mathematical induction to prove if  $F_n$  is the  $n^{\text{th}}$  Fibonacci number, then

$$F_n = \frac{1}{\sqrt{5}} \left[ \left( \frac{1+\sqrt{5}}{2} \right)^{n+1} - \left( \frac{1-\sqrt{5}}{2} \right)^{n+1} \right] \quad \text{For all integers } n \geq 0.$$

8M

## (OR)

3 a) Write about the methods of proof of an implication.

6M

b) Prove or disprove the validity of the given arguments:

$$\text{i. } p \rightarrow (q \rightarrow r)$$

$$\text{ii. } \sim p \leftrightarrow q$$

$$\sim q \rightarrow \sim p$$

$$q \rightarrow r$$

$$p$$

$$\sim r$$

$$\therefore r$$

$$\therefore p$$

6M

## UNIT II

4 a) Find the co-efficient of  $X^{16}$  in  $(1+X^4+X^8)^{10}$ .

3M

b) Compute the co-efficient of  $\sum_{r=0}^{\infty} d_r X^r = \frac{X^2 - 5X + 3}{X^4 - 5X^2 + 4}$ 

9M

## (OR)

5 a) A computer password consists of letter followed by 4 characters (letters) and 3 digits. Find out the number of possible passwords.

5M

b) How many integral solutions are there to  $x_1 + x_2 + x_3 + x_4 + x_5 \leq 19$ 

7M

## UNIT III

6 a) Find a general expression for a solution to the recurrence relation

$$a_n - 7a_{n-1} + 10a_{n-2} = 7 \cdot 3^n + 4^n \text{ for } n \geq 2 \text{ using undetermined coefficients method.}$$

6M

b) Solve the recurrence relation  $a_n - 3a_{n-1} - 4a_{n-2} = 0$  for  $n \geq 2$  and  $a_0 = a_1 = 1$  by using characteristic roots.

6M

## (OR)

7 a) Consider the relation  $R = \{(a,b), (b,c), (b,d), (d,d), (c,c), (a,c)\}$ 

i. Draw a diagraph for the relation R.

ii. Draw the diagraph for the inverse  $R, R^{-1}$ 

6M

b) Give an example of a non empty set and a relation on the set that satisfies each of the following combinations of properties; draw a di-graph of the relation

i. Symmetric and transitive, but not reflexive.

ii. Symmetric and reflexive, but not transitive.

iii. Transitive and reflexive, but not Symmetric.

iv. Transitive and reflexive, but not antisymmetric.

6M

- v. Transitive and antisymmetric, but not reflexive.
- vi. Antisymmetric and reflexive, but not transitive.

## CS/IT 215

### UNIT IV

- |             |    |  |    |
|-------------|----|--|----|
| 8           | a) | State and prove euler's formula?   | 5M |
|             | b) | Prove that every simple planar graph is 5-colorable.   | 7M |
| <b>(OR)</b> |    |  |    |
| 9           | a) | What is Hamiltonian Circle? Give two Hamiltonian circuits in $K_5$ that have no edges in common.   | 7M |
|             | b) | Using warshall's algorithm find the adjacency matrix of the transitive closure of the relation $R=\{(a,a),(a,d),(b,a),(b,b),(c,c),(d,d)\}$ . | 5M |