B.TECH
(SEM IV) THEORY EXAMINATION 2018-19
DISCRETE MATHEMATICS

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt** *all* **questions in brief.**   **2 x 10 = 20**

a.   Let R be the relation from the set A = {1,3,4} on itself and defined by R= {(1, 1), (1, 3), (3, 3), (4, 4)}.then find the relation matrix.

b.   Find the domain and range of f(x) =sinx –cosx.

c.   What type of sentence is 5+x =9? For what value of x it will become a true statement.

d.   Define the Conjunction terms with appropriate truth table.

e.   How many ways are there to arrange the nine letters in the word ALLAHABAD?

f.   In how many ways can 8 students be arranged in a circle?

g.   Define the Recursively Defined function.

h.   Find the Generating function of the following series 1,1,1,1,1,1,1.

i.   Draw all simple graphs of one, two, three and four vertices.

j.   Define Hamiltonian graph.

SECTION B

2.   **Attempt any** *three* **of the following:**   **10x3=30**

a.   Let A= {1, 2, 3, 4, 5, 6} and let R be the relation x divides y. (I) Write R as a set of ordered pairs(ii) Draw its directed graph (iii) Find R^{-1}.

b.   Test the validity of the argument: if 8 is even then 2 does not divide 9. 7 is not prime or 2 divides 9.But 7 is prime, therefore, 8 is odd.

c.   A committee of 5 is to be formed out of 6 gents and 4 ladies. In how many ways this can be done when (I) at least 2 ladies are included (ii) at most 2 ladies are included.

d.   Solve the recurrence relation$a_{r+2} - 6a_{r+1} + 8a_r = 3r^2 + 2 - 5(3^r)$.

e.   Prove that a graph is bipartite if and only if all its circuits are of even length.

SECTION C

3.   **Attempt any** *one* **part of the following:**   **10x1=10**

a.   Let $f: R \to R$ be a function defind by $f(x) = px + q, \forall x \in R$.Then find $fof = I_R$, Also find the values of p and q.

b.   Prove that the set G= {0, 1, 2, 3, 4, 5} is a finite abelian group of order 6 with respect to addition modulo 6.

4. **Attempt any *one* part of the following:** **10x1=10**

a. Define quantifiers, universal quantifiers and existential quantifiers by giving an example.

b. Define the following terms with appropriate truth table (I)Conjunction (ii) Disjunction (iii) conditional (iv) Negation.

5. **Attempt any *one* part of the following:** **10x1=10**

a. How many integer solutions are there to the equations: $x_1 + x_2 + x_3 + x_4 = 13, 0 \leq x_i \leq 5 \; where \; i = 1,2,3,4.$

b. State and prove pigeonhole principle.

6. **Attempt any *one* part of the following:** **10x1=10**

a. Solve the recurrence relation $a_{r+2} - 2a_{r+1} + a_r = 2^r$.by the method of generating function with initial conditions $a_0 = 2 \; and \; a_1 = 1$.

b. Solve the recurrence relation $a_r - 7a_{r-1} + 10a_{r-2} = 0, \forall \geq 2 \; given \; that \; a_0 = 10, a_1 = 41$ using generating functions.

7. **Attempt any *one* part of the following:** **10x1=10**

a. A tree has two vertices of degree 2, one vertex of degree 3 and three vertices of degree 4.How many vertices of degree 1 does it have?

b. Prove that a binary tree with n nodes has exactly (n + 1) null branches.