

Printed Pages:2

Sub Code: EOE 048/NOE 048

Paper Id: 199232

Roll No.

--	--	--	--	--	--	--	--	--	--

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 $f(x) = \sin x - \cos x$.
- 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 $f: R \rightarrow R$ be a function defined by $f(x) = px + q, \forall x \in R$. Then find $f \circ f = I_R$, 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 $a_r - 7a_{r-1} + 10a_{r-2} = 0, \forall r \geq 2$ 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.