 Sub Code:EOE038/NOE038

Paper Id: 199328 **Roll No:**

B. TECH
(SEM IV) THEORY EXAMINATION 2019-20
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 $=\{(1,1),(2,1),(3,2)\}$, compute R^2.
b.	Distinguish between $\emptyset, \{\emptyset\}, \{0\}, 0$.
c.	What type of sentence is 5+x =9? For what value of x it will become a true statement.
d.	Define the Disjunction terms with appropriate truth table.
e.	How many ways are there to arrange the eight letters in the word CALCUTTA?
f.	In how many ways can 12 students be arranged in a circle?
g.	Define the Recursively Defined function.
h.	Find the Generating function of the following series b,b,b,b,b,b,b.
i.	Draw all simple graphs of one, two, three and four vertices.
j.	Define Planar graph.

SECTION B

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

a.	For the set $I_4 = \{0,1,2,3\}$, show that the modulo 4 system is a field.
b.	Obtain the principal conjunctive normal form (I) $p \wedge q$ using truth table (II)$(\sim p \Rightarrow r) \wedge (q \Leftrightarrow p)$without using truth table.
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 $a_{n+2} - a_{n+1} - 2a_n = n^2$.
e.	Find the number of perfect matching in the complete bipartite graph $k_{n,n}$.

SECTION C

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

a.	Let $R = \{(1,2),(2,3),(3,1)\} and\ A = \{1,2,3\}$,find the reflexive ,symmetric and transitive closure of R ,using (I) Composition of relation R (II) Composition of matrix relation R.
b.	Prove that the fourth roots of unity 1,-1,i,-i form an abelian multiplicative group.

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

a.	Define quantifiers, universal quantifiers and existential quantifiers by giving an example.
b.	Prove by mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer n .

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 $a_{n+2} - 2a_{n+1} + a_n = 2^n$.by the method of generating function with initial conditions $a_0 = 2\ and\ a_1 = 1$.
b.	Solve the recurrence relation $a_{n+2} + 2a_{n+1} - 15a_n = 6n + 10, given\ that\ a_0 = 1, a_1 = -\frac{1}{2}$.

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 the maximum number of vertices on level n of a binary tree is $2^n\ where\ n \geq 0$.