

Paper Id:

199270

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

*Time: 3 Hours**Total Marks: 70***Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A**

- 1. Attempt all questions in brief. 2 x 7 = 14**
- Define a relation R which is reflexive, symmetric, anti-symmetric and transitive for a set $A = \{1, 2, 3, 4\}$.
 - Define semi group with example.
 - Write truth table for the statement of two variables which is always false
 - Find the number of ways in which 7 persons can be seated at a round table.
 - What is a generating function of $(1, -1, 1, -1, \dots)$?
 - Give an example of graph which is connected, regular and complete.
 - What is chromatic number? Also write a chromatic number of a tree.

SECTION B

- 2. Attempt any three of the following: 7 x 3 = 21**
- What is relation? Write the different representations of relation. Also write the different classification of relation with example.
 - Define proposition and its connectives. Also prove that $(p \vee q) \rightarrow (p \wedge q)$ is logically equivalent to $p \leftrightarrow q$.
 - Use principle of induction to prove that $11^{n+2} + 12^{2n+1}$ is divisible by 133.
 - Solve the recurrence relation

$$a_n - 4a_{n-1} + 4a_{n-2} = n, \forall n \geq 2 \text{ with } a_0 = 0, a_1 = 1$$
 - Define tree and its properties. Also explain preorder, inorder and postorder of tree with the help an example.

SECTION C

- 3. Attempt any one part of the following: 7 x 1 = 7**
- What is composition of functions? Also prove that $f^{-1} \circ g^{-1} = (g \circ f)^{-1}$ where $f: Q \rightarrow Q$ such that $f(x) = 2x$ and $g: Q \rightarrow Q$ such that $g(x) = x + 2$ are two functions.
 - Define an abelian group. Let $S = \{0, 1, 2, 3, 4, 5, 6, 7\}$ and $*$ denotes multiplication modulo 8 i.e $x * y = (x * y) \bmod 8$. Prove that $(S, *)$ is an abelian group

4. Attempt any *one* part of the following: 7 x 1 = 7

- (a) Explain the quantifiers in details. Also write the following English language into symbolic statement.

“Every students of this class is either hosteller or non-hosteller”

- (b) Define converse, inverse and contra-positive statements. Also write converse, inverse and contra-positive statements for the following statement.

“ If I will secure position in university then I will be awarded by university”

5. Attempt any *one* part of the following: 7 x 1 = 7

- (a) In a B.Tech. class of 40 students 5 are weak. Determine how many ways we can make a group of students (i) 5 good students (ii) 5 students in which exactly 3 are weak.

- (b) What is mathematical induction? Also prove that $n < 2^n$ for all positive integral value of n.

6. Attempt any *one* part of the following: 7 x 1 = 7

- (a) Solve the following recurrence relation using generating function

$$a_r - 5a_{r-1} + 6a_{r-2} = 0 \quad \text{with } a_0=1, a_1=1.$$

- (b) What is recurrence relation? Solve the following recurrence relation

$$a_n = a_{\frac{n}{2}} + n \quad \text{with } a_1 = 1$$

7. Attempt any *one* part of the following: 7 x 1 = 7

- (a) Make a Binary search tree for the following sequence of numbers:

45, 36, 23, 89, 115, 98, 39, 41, 56, 69, 48, 40.

Also find the pre-order, in-order and post-order of the resultant tree.

- (b) Define the following graph with example:

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|--------------------------|----------------------|
| (i) Regular Graph | (ii) Euler Graph |
| (iii) Hamiltonian Graphs | (iv) Connected Graph |
| (v) Complete Graph | |