

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

Time: 3 Hours**Total Marks: 70****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 7 = 14**

- a) Define sets and it types.
- b) Define Proposition with example.
- c) Let A and B be sets. Show that $A*B \neq B*A$. Under What Condition $A*B=B*A$
- d) Prove for any two sets A and B that, $(A \cup B)' = A' \cap B'$
- e) Explain Ring with the help of example.
- f) State and prove pigeonhole principle
- g) Define transitive closure with suitable example.

SECTION B**2. Attempt any three of the following: 7 x 3 = 21**

- a) Construct the truth table for:

$$[(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow R) \rightarrow R]$$

Also show that the above statement is a tautology by developing a series of logical equivalences.

- b) Define preorder, inorder and postorder tree traversal. Give an example of preorder, postorder and inorder.
- c) Solve $a_n + 3a_{n-1} - 10a_{n-2} = n^2 + n + 1$.
- d) Prove that partially ordered set D_{15} under the relation 'Divides' is a lattice.
- e) If ${}^{2n+1}P_{n-1} : {}^{2n-1}P_n = 3.5$, find the value of n.

SECTION C**3. Attempt any one part of the following: 7 x 1 = 7**

- a) Give an example of set x such that $\langle P(X), \subseteq \rangle$ is a totally ordered set.
- b) In a group of 600 people 350 can speak English only and 170 can speak Hindi only.
 - i. How many can speak Hindi?
 - ii. How many can speak Hindi and English both?

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

- a) Discuss the Algebraic Structure and its properties in detail.
- b) Let $G = \{a, a^2, a^3, a^4, a^5, a^6 = e\}$. Find the order of every element.

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

- a) Define Poset. What is totally or linearly ordered set?
- b) Draw the Hasse diagram of $[p(a, b, c), \subseteq]$. Find greatest element, least element, minimal element and maximal element.

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

- a) Show the following implications without constructing the truth tables:
 - I. $(P \wedge Q) \Rightarrow (P \rightarrow Q)$
 - II. $(P \rightarrow Q \Leftrightarrow P) \rightarrow (P \wedge Q)$
- b) Define free and bound variable. Also explain the multiple quantifiers with the example.

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

- a) Define permutation and combination with the help of any example; also explain the difference between them.
- b) Solve the recurrence Relation: $a_r + 4a_{r-2} + 4a_{r-2} = r^2$.