

Roll No.

Total No. of Pages : 02

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B.Tech. (CSE and DS) (Sem.-4)

DISCRETE MATHEMATICS

Subject Code : BTCS-401-18

M.Code : 91948

Date of Examination : 09-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly :

- a) Prove that $A \cap (B - A) = \emptyset$.
- b) If ${}^nC_7 = {}^nC_5$, find n .
- c) Write the truth table of the logical statement $a \rightarrow b$.
- d) Obtain the linear recurrence relation from the sequence defined by $S_n = 3^n$.
- e) Give an explicit example of a function which is 1-1 and onto.
- f) In how many ways 5 pearls and 6 beads can be arranged in a garland so that no two pearls can be placed together.
- g) Define ring and Integral domain.
- h) What is chromatic number of a graph?
- i) If $\{B, +, \cdot, '\}$ is a Boolean algebra, then prove that $a \cdot 0 = 0 \forall a \in B$.
- j) Define Eulerian and Hamiltonian Paths.

SECTION-B

2. If a graph G has more than two vertices of odd degree, then prove that there can be no Euler path in G .
3. If p stands for the statement : “I will not go to college” and q stand for the statement : “I will watch a movie”, then what does $p \vee q$ stands for?
4. Using Principal of Mathematical Induction, prove that the following statement :

$$5 + 15 + 45 + \dots + 5 \cdot (3)^{n-1} = \frac{5}{2}(3^n - 1) \text{ is true } \forall n \in \mathbb{N}.$$

5. Suppose that 100 of the 120 Mathematics students at a college take at least one of the languages French, German and Russian. Also suppose 65 study French, 45 study German, 42 study Russian, 20 study French and German, 25 study French and Russian, 15 study German and Russian. Then
 - a) Find the number of students studying all the languages.
 - b) Find the number of students studying exactly one language.
6. Simplify the Boolean expression: $a \{b' (c' + d) + cd\} + (a' + b)(cd' + d)$.

SECTION-C

7.
 - a) Prove that the order of a subgroup divides the order of the group. Is the converse true. Justify.
 - b) If p and q are two statements, then check the validity of the argument $(S_1, S_2; S)$, where $S_1 : \text{if } p \text{ then } q$, $S_2 : p$ and $S : q$.
8.
 - a) State and prove Exclusion-Inclusion Principle for three sets.
 - b) Write the sequence whose generating function is $\frac{6 - 29z}{1 - 11z + 30z^2}$
9.
 - a) Prove that a function $f: X \rightarrow Y$ is invertible iff there exists a function $g: Y \rightarrow X$ such that $gof = I_x$ and $fog = I_y$.
 - b) Let G is a finite cycle free graph with at least one edge, show that G has at least two vertices of degree 1.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.