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ND—09—2023

FACULTY OF SCIENCE & TECHNOLOGY

B.Sc. (C.S.) (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(CBCS/Revised)

DISCRETE MATHEMATICS

(Friday, 1-12-2023) **Time : 2.00 p.m. to 5.00 p.m.**

Time—Three Hours *Maximum Marks*—75

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data, if required.

(*iv*) Each question carries equal marks.

1. Attempt any *five* of the following : 15

(*a*) Write a note on types of sets.

(*b*) Explain logical equivalence.

(*c*) Describe scalar multiplication of matrix.

(*d*) Explain determinants.

(*e*) Explain centre of tree.

(*f*) Explain relation

(*g*) Explain inverse of matrices.

2. Attempt any *three* of the following : 15

(*a*) Explain set operations.

(*b*) Describe statement pattern and logical equivalence.

(*c*) Describe set in detail.

(*d*) if sets :

$A = \{0, 5, 7, 8, 9\}$,

$B = \{1, 3, 4, 6, 7, 8\}$

$C = \{2, 4, 6, 8\}$

$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

then verify that :

(*i*) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(*ii*) $(A \cup B)^C = A^C \cap B^C$

(*e*) Construct the truth table for the following statement pattern :

$$(p \vee r) \leftrightarrow (q \rightarrow r)$$

3. Attempt any *three* of the following : 15

(*a*) Obtain domain and range of the function :

$$f(x) = \frac{x+1}{3-x}$$

(*b*) Explain different logical connectives.

(*c*) Show that a relation F defined on the set of real numbers R as $(a, b) \in F$ if and only if $|a| = |b|$ is an equivalence relation.

(*d*) Explain Cartesian products.

(*e*) Determine whether the following statement pattern is a tautology or contradiction or contingency :

$$(q \leftrightarrow p) \vee r$$

4. Answer any *three* of the following : 15

(*a*) Explain transpose of matrix.

(*b*) Explain matrix in detail.

(*c*) What is the distance between two points P and Q whose coordinates are (–3, 1) and (5, – 4), respectively ?

(*d*) Find the adjoint of the matrix :

$$A = \begin{bmatrix} 3 & 5 & -1 \\ 2 & 4 & 2 \\ -1 & 3 & -1 \end{bmatrix}$$

(*e*) Find the equation of a straight line that passes through the points (1, 3) and (–2, 4).

P.T.O.

5. Attempt any *three* of the following : 15

(*a*) Prove that the number of vertices of odd degree in a graph is always even.

(*b*) Find the Cartesian product C × D if C = {*p*, *q*, *r*,} and D = {*x*, *y*, *z*}

(*c*) Write a note on binary tree.

(*d*) If :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ -1 & -2 & -3 \end{bmatrix}$$

then show that A^2 is a null matrix.

(*e*) Explain isomorphism of graphs.