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NY—190—2023

FACULTY OF SCIENCE AND TECHNOLOGY

M.Sc. (First Year) (First Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(CBCS/New Pattern)

COMPUTER SCIENCE

Paper CS-103

(Mathematical Foundation for Computer Science)

(Saturday, 9-12-2023)

Time : 10.00 a.m. to 1.00 p.m.

Time—Three Hours

Maximum Marks—75

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

(ii) Draw well labelled diagram wherever necessary to illustrate your answers.

(iii) Assume suitable data, if required.

1. Attempt the following questions :

(A) State and verify all laws of set union and intersection with suitable example. 15

Or

(B) (a) If $A = \{a, b, c, d\}$, $B = \{x, y, z\}$ and $C = \{1, 2, 3\}$, then find :

(i) $(A \cup C) \times B$ 8

(ii) $(A \cup B) \times C$.

(b) Explain partition of the sets. 7

P.T.O.

2. Attempt the following questions :

(A) Construct the truth table for the following statement pattern : 15

(i) $(p \wedge q) \rightarrow r$

(ii) $(q \vee r) \wedge p$

(iii) $(p \vee q) \leftrightarrow (r \wedge p)$.

Or

(B) (a) Using truth table show that the following two statement patterns are equivalent. 8

$$p \wedge (q \vee r); (p \wedge q) \vee (p \wedge r)$$

(b) Describe normal forms. 7

3. Attempt the following questions :

(A) Explain the following terms : 15

(i) Poset

(ii) Lattice

(iii) Pigeon-hole principle.

Or

(B) (a) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done ? 8

(b) In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together ? 7

4. Attempt the following questions :

(A) Explain the following terms : 15

(i) Graph

(ii) Path

(iii) Circuit.

Or

(B) (a) If $f(x) = x^3$, $g(x) = 2x$ and $h(x) = x + 3$, then prove that
 $(f \circ g) \circ h = f \circ (g \circ h)$. 8

(b) Define a relation R from A to A = {1, 2, 3, 4, 5, 6} as
 $R = \{(x, y) : y = x + 1\}$. Determine the domain, codomain and
range of R. 7

5. Write short notes on any *three* of the following : 15

(a) Semigroup

(b) Hamiltonian graph

(c) Group codes

(d) Isomorphism of graphs

(e) Cyclic groups.