H Roll No. .....

TBC–103

B. C. A. (H) (FIRST SEMESTER)

MID SEMESTER

EXAMINATION, Jan., 2023

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Time : 1½ Hours

Maximum Marks : 50

Note : (i) Answer all the questions by choosing any ***one*** of the sub-questions.

(ii) Each sub-question carries 10 marks.

1. (a) Define the following : (CO1)

(i) Composition of relation

(ii) Equivalence relation

(iii) Indegree and outdegree of a graph

(iv) Antisymmetric relation

P. T. O.

OR

(b) If R is an equivalence relation then show that R^{-1} is also an equivalence relation. (CO1)

2. (a) If R is a relation defined on the set of natural numbers such that : (CO1)

$R = \{(a, b) : a \text{ is divisible by } b\}$

then show that R is a partial order relation.

OR

(b) Define the inverse of a relation. (CO1)

A relation R is defined from a set A to B such that $a > b$ where $a \in A$ and $b \in B$ and

$A = \{2, 4, 6\}, B = \{1, 2, 3\}$

Find the relation R and find R^{-1}.

3. (a) Define poset and draw the Hasse diagram of $(P(x), \subseteq)$ for $X = \{a, b, c\}$. (CO1)

OR

(b) Define function and any two types of function with proper example. (CO1)

4. (a) Let $f : Z \to Z$ be function defined as $f(x) = x + 5$. Determine whether the function is invertible or not. If it is invertible, then find its inverse. (CO2)

OR

(b) Let $f(x) = x + 3$, $g(x) = x - 4$, $h(x) = 2x$ then find f o x (x), h o f (x) and $g \circ f \circ h\,(x)$. (CO2)

5. (a) What are recursively defined functions ? Write the recursive definition of the function $f(x) = 2^x$ defined from the set of natural numbers (including 0) to the set of natural numbers. (CO2)

OR

(b) If R is the set of all real numbers, then discuss the type of function defined by $f : R \to R$ such that $f(x) = x^2 \ \forall \times \in R$. (CO2)

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