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TBC–103

B. C. A. (FIRST SEMESTER)
MID SEMESTER
EXAMINATION, Nov., 2022
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) Represent the relation R = {(1, 1), (2, 1), (2, 2), (2, 3), (3, 3)} defined on set A = {1, 2, 3} as the matrix form and directed graph. (CO1)

OR

(b) Prove that the relation R = {(a, b) : $a, b \in$ L and a is parallel to b} is an equivalence relation, where L is the family of straight lines. (CO1)

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2. (a) Prove that the relation R = {(*a*, *b*) : *a*, *b* ∈ Z and *a* is less than and equal to *b*} is partial ordering relation, where Z is the set of integers. (CO1)

OR

(b) Let A = {2, 3, 5} and B = {6, 8, 10} and define a binary relation R from A to B as R = {(*a*, *b*) : *a* ∈ A, *b* ∈ B and *a* divides *b*}. Write each R and R^{-1} as a set of ordered pairs. Then find the domain and range for each R and R^{-1}. (CO1)

3. (a) Let R = {(1, 2), (3, 4), (2, 2)} and S = {(4, 2), (2, 5), (3, 1), (1, 3)}. Find the compositions R o S and S o R. (CO1)

OR

(b) Draw the Hasse diagram for the POSET [{1, 2, 3, 4, 6, 12}, /], where '/' denotes "divide." Also find the maximal and minimal elements. (CO1)

4. (a) Define the inverse function. Find the inverse of the function $f : R \to R$ defined by $f(x) = 3x + 2$. (CO2)

OR

(b) Define the following with proper examples : (CO2)

(i) Constant function

(ii) Bijective function

5. (a) Show that the function $f : R \to R$ defined by $f(x) = x^2$ is one-to-one but not onto. (CO2)

OR

(b) Let $f : R \to R$ and $g : R \to R$ be function defined by $f(x) = \sin x$ and $g(x) = x^2$, find f o g and g o f. (CO2)