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Roll No. ....

**TBC-103/TBI-103**

**B. C. A./B. SC. (IT)**

**(FIRST SEMESTER) MID SEMESTER  
EXAMINATION, 2021-22**

**MATHEMATICAL FOUNDATION OF  
COMPUTER SCIENCE**

**Time : 1 : 30 Hours**

**Maximum Marks : 50**

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

(ii) Each question carries 10 marks.

1. (a) Define the following with proper examples :  
(CO1)

(i) Cardinality of a set

(ii) Disjoint sets

(iii) Indegree and outdegree of a graph

(iv) Difference of two sets

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OR

- (b) Define equivalence relation and show that the relation '*parallel to*' in a set of straight lines is an equivalence relation. (CO1)

2. (a) State and prove De Morgan's law. (CO1)

OR

- (b) Define the inverse of a relation.

A relation  $R$  is defined from a set  $A$  to  $B$  such that  $a \leq b$ , where  $a \in A$  and  $b \in B$  and  $A = \{1, 2, 3\}$ ,  $B = \{2, 3\}$ .

Find the relation  $R$  and find  $R^{-1}$ . (CO1)

3. (a) Define any *four* operations on sets with proper example and Venn diagrams. (CO1)

OR

- (b) Check the following equivalence relations with the help of truth table : (CO2)

(i)  $(P \rightarrow Q) \wedge (P \rightarrow R) \equiv P \rightarrow (Q \wedge R)$

(ii)  $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow R) \equiv R$

(3)

4. (a) Define Tautology and Contradiction with proper example and check the following expression whether it is a tautology or contradiction : (CO2)

$$((P \rightarrow Q) \vee R) \leftrightarrow ((P \vee R) \rightarrow (Q \vee R)).$$

OR

- (b) Write the given expression  $(P \rightarrow Q) \rightarrow R$  in principal disjunctive normal form (PDNF) and principal conjunctive normal form without using the truth table. (CO2)

5. (a) Define any *four* logical operators with proper truth table. (CO2)

OR

- (b) Define argument and check the validity of the given argument :

You go to school or you go for tuition.  
You do not go to school or you go to market. Therefore, either you go for tuition or you go to market. (CO2)