H Roll No. .....

TMA–316

B. TECH. (CSE) (THIRD SEMESTER)

MID SEMESTER EXAMINATION, 2021

DISCRETE STRUCTURE AND COMBINATORICS

Time : 1½ 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 inverse of a function. When does a function have an inverse ? Does the function $f(n) = 10 - n$ from the set of integers to the set of integers have an inverse ? If so, what is it ?

10 Marks (CO3)

P. T. O.

OR

(b) Show that these statements about the integers n are equivalent :

p_1 : n is even.

p_2 : $n-1$ is odd.

p_3 : n^2 is even. 10 Marks (CO3)

2. (a) Show that $\begin{bmatrix} 2 & 3 & -1 \\ 1 & 2 & 1 \\ -1 & -1 & 3 \end{bmatrix}$ is the inverse of $\begin{bmatrix} 7 & -8 & 5 \\ -4 & 5 & -3 \\ 1 & -1 & 1 \end{bmatrix}$. 10 Marks (CO1)

OR

(b) (i) Is the "divides" relation on the set of positive integers symmetric ? Is it anti-symmetric ?

(ii) Show that the relation $R = \phi$ on the empty set $S = \phi$ is reflexive, symmetric and transitive.

10 Marks (CO1)

3. (a) Let A = {0, 1, 2} × {2, 5, 8}
= {(0, 2), (0, 5), (0, 8), (1, 2), (1, 5), (1, 8), (2, 2), (2, 5), (2, 8)}

A partial order relation R on A is defined by (a, b) R (c, d) if and only if $(a + b)$ divides $(c + d)$.

(i) Draw a Hasse diagram for the poset A.

(ii) What are the maximal and minimal elements of the poset A ? Does A have greatest and/or the least element ?

10 Marks (CO1)

OR

(b) (i) Give an example of a lattice that is not distributive.

(ii) Give an example of a finite lattice where at least one element has more than one complement and at least one element has no complement.

10 Marks (CO1)

4. (a) Construct truth tables for :

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

(ii) $(\overline{p} \vee q) \leftrightarrow \overline{r}$

10 Marks (CO3)

P. T. O.

OR

(b) Test the validity of the following argument :

"If you are a mathematician, then you are clever. You are clever and rich. Therefore if you are rich, then you are mathematician." 10 Marks (CO3)

5. (a) Define the following :

(i) Function

(ii) Tautology

(iii) Contradiction

(iv) Lattice

(v) Principle of Induction

10 Marks (CO1)

OR

(b) Write short notes on the following :

(i) Converse

(ii) Contrapositive

(iii) Inverse

(iv) Equivalence Relation

(v) Universal Quantifier

10 Marks (CO1)