H Roll No. .....

TMA–316

B. TECH. (CSE) (THIRD SEMESTER)

MID SEMESTER EXAMINATION, 2022

DISCRETE STRUCTURES 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) (i) State and prove De-Morgan's law.

(ii) Define the following :

Invertible function and Composition of function. 10 Marks (CO1)

P. T. O.

OR

(b) Prove that the relation :

$R = \{(a, b) : (a - b)$ is divisible by $6 \; \forall \; a, b \in Z\}$

is an equivalence relation. 10 Marks (CO1)

2. (a) Show that the relation "less than and equal to" is a partial order relation on the set of integers. 10 Marks (CO1)

OR

(b) Define the following : 10 Marks (CO1)

(i) Lattices with properties

(ii) Sub-lattice and isomorphic lattice

3. (a) Define the following : 10 Marks (CO1)

(i) Poisson distribution

(ii) Random variables

(iii) Bayes' theorem

OR

(b) Find the mean and variance of the number of points obtained in a single throw with an ordinary dice. 10 Marks (CO1)

4. (a) A random variable X has the following probability distribution : 10 Marks (CO2)

X	P (x)
0	k
1	$3k$
2	$5k$
3	$7k$
4	$9k$
5	$11k$
6	$13k$
7	$15k$
8	$17k$

Find :

(i) the value of k

(ii) P ($X < 3$)

(iii) P ($2 < X < 6$).

OR

(b) A die is thrown 8 times and it is required to find the probability that 3 will show (i) exactly 2 times, (ii) at least seven times and (iii) at least once. 10 Marks (CO2)

P. T. O.

5. (a) Draw the Hasse diagram for the Poset $A = \{1, 2, 3, 4, 12\}$ under the relation "a divides b" when $a \leq b$. 10 Marks (CO2)

OR

(b) In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machines A, B and C ? 10 Marks (CO2)