



Term Evaluation (Odd) Semester Examination - November 2025

Roll no.

Name of the Course: Bachelor of Technology

Semester: 3rd

Name of the Paper: Discrete Structures and Combinatorics

Paper Code: TMA 316

Time: 1.5 Hour

Maximum Marks: 50

Note:

- (i) Answer all the questions by choosing any one of the sub-questions
- (ii) Each question carries 10 marks.

Q1. (10 Marks) (CO 1)

a) Prove that the relation $R = \{(a,b): a \text{ divides } b (a|b), a,b \in \mathbb{N}\}$ is a lattice.

OR

b) Find the transitive closure of the relation $R = \{(1,3) (3,2) (2,4) (3,1) (4,1)\}$ defined on the set $A = \{1,2,3,4\}$

Q2. (10 Marks)-(CO1)

a) What is an equivalence relation. Prove that the relation

$$R = \{(x,y) : (x-y) \text{ is divisible by } 5, x,y \in \mathbb{Z}\}$$

is an equivalence relation.

OR

b) Let $f(x) = 2 + \sin x^2$ and $g(x) = e^x$. Find $f \circ f$, $g \circ g$, $f \circ g$ and $g \circ f$.

Q3. (10 Marks) (CO1 & 2)

a) Construct a Hasse diagram for the relation $a \text{ divides } b (a|b)$ on the set $A = \{1,2,3,4,6,12,18,36\}$.

Also find the element(s) which is/are (a) Greatest (b) Maximal (c) Minimal (d) Least.

OR

b) An unbiased coin is tossed 4 times. Find the probability of obtaining

(1) Exactly 4 heads (2) less than 3 heads (3) more than 1 heads (4) at least 2 heads.

Q4. (10 Marks) (CO2)

a) Given

X	0	1	2	3	4	5	6	7
P(x=X)	k	3k	5k	7k	9k	12k	15k	8k

Find the value of k. Hence find the Expected Mean (expectation) and Variance of X. Also find $P(X < 3)$ and $P(2 < X < 6)$.

OR

b) There are 3 bags A, B and C. A contains 4 white and 5 red balls, b contains 2 white and 3 red balls, and C contains 3 white and 5 red balls. A bag is chosen at random and a ball is selected. The ball turns to be red. Find the probability that the ball is selected from bag A.

Q5. (10 Marks) (CO2)

a) Daily income of workers follows Normal distribution with Mean = Rs.1000 and Standard Deviation = Rs.100. Find the probability of the income

(i) Less than Rs.1100

(ii) More than Rs.1100

(iii) Less than Rs.790.

Given $P(Z=1)=0.3413$, $P(Z=2.1)=0.4821$

OR

b) A factory produces lightbulbs, and the average rate of defective bulbs is 2 per batch of 1000. What is the probability that exactly 1 defective bulb is found in a randomly selected batch of 1000?