

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

First Semester

M.E. - Industrial Safety Engineering

24PISMA101 - PROBABILITY AND STATISTICAL METHODS

Regulations - 2024

(Statistical table should be provided)

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	Marks	K- Level	CO
1. Two dice are thrown once. What is the probability of getting a doublet? (a) 6 (b) $\frac{1}{6}$ (c) $\frac{1}{3}$ (d) $\frac{1}{6}$	1	K2	CO1
2. If the parameter of the Poisson distribution is λ , then the variance is given (a) λ (b) λ^2 (c) 1 (d) $\frac{1}{\lambda^2}$	1	K1	CO1
3. If $r = 1$, then the correlation is (a) positive (b) perfect (c) both a and b (d) none	1	K1	CO2
4. Which of the following is the point estimator (a) confidence interval (b) sample mean (c) population mean (d) range	1	K2	CO2
5. The particular form of the t –distribution is determined by its (a) mean (b) variance (c) degrees of freedom (d) parameters	1	K1	CO3
6. The Chi-square (χ^2) distribution is used for (a) Testing mean of population (b) Testing variance of population (c) Testing correlation (d) Testing regression	1	K1	CO3
7. Anova is used to compare (a) Two population means (b) variance only (c) More than two population means (d) medians only	1	K1	CO4
8. The degrees of freedom for treatment in an $r \times r$ Latin Square design is (a) r (b) $r - 1$ (c) $r - 2$ (d) $2r - 1$	1	K1	CO4
9. Exponential smoothing is a type of? (a) Regression technique (b) Averaging technique (c) clustering technique (d) optimization technique	1	K1	CO5
10. The error term in an Auto regression model is assumed to be (a) seriously correlated (b) Independent and identically distributed (c) Growing exponentially (d) Number of error terms	1	K2	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. State Baye's Theorem.	2	K1	CO1
12. If a random variable X has the moment generating function $M_x(t) = \frac{3}{3-t}$, Obtain the standard deviation of X .	2	K2	CO1
13. Define point estimation.	2	K1	CO2
14. Find the mean values of the variables X and Y and correlation coefficient from the following regression equations $2Y - X - 50 = 0$; $3Y - 2X - 10 = 0$.	2	K2	CO2
15. What is Type - I and Type - II errors?	2	K1	CO3
16. Write 2×2 contingency table for χ^2 –test for independence of attributes.	2	K1	CO3
17. Define factorial design.	2	K1	CO4
18. State the differences between Latin Square and Randomized Block Design.	2	K1	CO4
19. Write the uses of time series analysis?	2	K1	CO5

20. What are the merits and limitations of the least square method? 2 K2 CO5
21. If A and B are independent events with $P(A) = 0.4$ and $P(B) = 0.5$ find $P(A \cup B)$. 2 K2 CO1
22. A die is thrown until 6 appears. What is the probability that it must be thrown more than four times? 2 K2 CO1

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) A random variable X has the following probability function: 11 K3 CO1

$X=x$	0	1	2	3	4	5	6	7
$P(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Find (i) k (ii) Evaluate $P(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$.

OR

- b) (i) The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month with (i) only one breakdown? (ii) no breakdown? (iii) at least one break down? 6 K3 CO1
- (ii) If X is Uniformly distributed over $(0, 10)$, find the probability that 5 K3 CO1
- (i) $X < 2$ (ii) $X > 8$ (iii) $3 < X < 9$?

24. a) Fit a straight-line $y = a + bx$ to the following data, using principle of least squares. 11 K3 CO2

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

OR

- b) Calculate the correlation co-efficient for the following heights in inches of father (X) and their sons (Y). 11 K3 CO2

Father X	65	66	67	67	68	69	70	72
Sons Y	67	68	65	68	72	72	69	71

25. a) Two independent samples of 8 and 7 items respectively had the following values: 11 K3 CO3

Sample-I	9	11	13	11	15	9	12	14
Sample-II	10	12	10	14	9	8	10	—

Test whether the significant difference about two sample means.

OR

- b) The theory predicts that the proportion of beans in the four groups: A, B, C & D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287, 118. Do the experimental results support the theory? 11 K3 CO3

26. a) Analyze the Randomized Block Design at 5% level of significance. 11 K3 CO4

Treatments	Variants		
	1	2	3
1	8	10	12
2	2	6	7
3	4	10	9
4	3	5	9

OR

- b) Identify the following design, perform an analysis of variance for the design and comment your findings: 11 K3 CO4

C	B	A	D
25	23	20	20
A	D	C	B
19	19	21	18
B	A	D	C
19	14	17	20
D	C	B	A
17	20	21	15

27. a) The prices of commodity during 1993 to 1998 are given below. Fit a parabola $Y = a + bX + CX^2$ to these data. Calculate the trend values. Estimate the price of the commodity for the year 1999. 11 K3 CO5

Years	1993	1994	1995	1996	1997	1998
Price	100	107	128	140	181	192

OR

- b) The following series of observations is known to have a business cycle with a period of 4 years. Find the trend values by the moving average method. 11 K3 CO5

Years	1989	1990	1991	1992	1993	1994	1995
Number of Students	506	620	735	865	798	663	779

28. a) Derive the Moment generating function of Uniform distribution also find its mean and variance. 11 K3 CO1

OR

- b) Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least 1 boy (iii) almost 2 girls and (iv) children of both genders. Assume equal probabilities for boys and girls. 11 K3 CO1