## Enrolment No/Seat No.: \_\_\_\_\_

## **R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT** (An Autonomous College U/s UGC Act 1956)

**B. Tech. SEMESTER-II, SEMESTER END EXAMINATION – SUMMER 2025** 

Subject Name: STATISTICS AND LINEAR ALGEBRA

## Instructions 1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper. 2. Write answers of Section A and Section B in separate answer books. 3. Attempt all questions from both Section A and Section B. 4. Each section carries **35 marks**, with a total of **70 marks** for the examination. 5. The figures to the right of each question indicate full marks, make suitable assumptions with justification. 6. BL - Bloom's Taxonomy Levels (R-Remember, U-Understanding, A – Application, N – Analyze, E – Evaluate, C -Create), CO - Course Outcomes. SECTION A Marks BL CO **Q.1 Multiple-Choice Questions** [05] (a) In a continuous probability distribution the sum of all the probabilities is 1 R 1 always equal to\_\_\_\_\_ (i) Zero (ii) One (iii)Minimum (iv) Maximum R 1 1 For a Poisson variate: P(X=1) = P(X=2) then the mean is \_\_\_\_\_ **(b)** (i) 2 **(ii)** 0 (iii) 1 (iv) -1 1 1 (c) The mean of Normal distribution is \_\_\_\_\_ Α (ii) $\sigma^2$ (i) $\sigma$ (iv) npq (iii) $\mu$ (d) If the null hypothesis is false then which of the following is accepted R 3 1 (i) Null Hypothesis (ii) Positive Hypothesis

(iii) Negative Hypothesis (iv) Alternative Hypothesis

Subject Code: 1SH205

Time: 11:00 AM to 02:00 PM

Date: 17-05-2025

**Total Marks:70** 

	(e) Which of the following is classified as unknown or exact value that represents the whole population?					
	(i) predictor (ii) guider					
	(iii) parameter (iv) estimator					
Q.2	Attempt Any Two	[10]				
	(a) A random variable $X$ has the following probability function:	5	Α	1		
	X 0 1 2 3 4					
	$P(X=x) \mid k \mid 3k \mid 5k \mid 7k \mid 9k$					
	Eind (i) k (ii) $P(Y < 3) P(Y > 3) P(0 < Y < 4)$ and (iii) distribution					
	function of $X$					
	(b) If the probability density function of a random variable is given by	5	Α	1		
	$k(1-x^2)$ , $0 < x < 1$					
	$f(x) = \begin{cases} 0 & , otherwise \end{cases}$					
	Find the value of $\vec{k}$ and the probabilities that a random variable having this					
	probability density will take on a value (i) between 0.1 and 0.2, (ii) greater					
	than 0.5. (a) The mean lifetime of a sample of 25 hulbs is found as $1550$ hours with a SD.	5	•	2		
	of 120 hours. The company manufacturing the bulbs claims that the average	5	A	3		
	life of their bulbs is 1600 hours. Is the claim acceptance at 5 % level of					
	significance?					
	(Hint: The critical value of $t$ at 5% level of significance is 1.711)					
Q.3	Attempt Any Two	[10]				
	(a) 4 coins are tossed simultaneously. What is the probability of getting (i) 2	5	Α	1		
	heads? (11) at least 2 heads? (111) at most 2 heads? (b) The number of accidents in a year attributed to taxi drivers in a city follows	5	Δ	1		
	Poisson distribution with a mean of 3. Out of 1000 taxi drivers, find	0	1	1		
	approximately the number of drivers with (i) no accidents in a year and (ii)					
	more than 3 accidents in a year. (c) If the main $f(2)$ of the density of $f(2)$ has the densit	-		1		
	and a standard deviation of 3 kg. How many students have weight (i) greater	3	A	I		
	than 72 kg? (ii) Less than or equal to 64 kg?					
	(Hint: $P(0 \le Z \le 1.33) = 0.4082$ )					
0.4	Attempt Any Two	[10]				
L.	(a) The means of two random samples of size 9 and 7 are 196.42 and 198.82	5	А	3		
	respectively. The sums of squares of the deviation from the mean are 26.94	-		•		
	and 18.73 respectively. Can the sample be considered to have been drawn					
	trom the same population? (Hint: The critical value of $t$ at 5% level of significance is 2.145)					
	(b) In a test given to two groups of students drawn from two normal	5	Α	3		
	populations, the marks obtained were as follows:					

Group I	18	20	36	50	49	36	34	49	41
Group II	29	28	26	35	30	44	46		

Examine at 5% level, whether the two populations have the same variances. (Hint: The critical value of F at 5% level of significance is 4.15)

(c) The number of car accidents in a metropolitan city was found to be 20, 17, 5 A 12, 6, 7, 15, 8, 5, 16 and 14 per month respectively. Use  $\chi^2$  test to check whether these frequencies are in agreement with the belief that the occurrence of accidents was the sane during 10 months period. Test at 5% level of significance.

(Hint: The critical value of  $\chi^2$  at 5% level of significance is 16.92)

## **SECTION B**

			Marks	BL	CO
Q.5	Multiple-Choice Questions		[05]		
	(a) The second moment about the mean	1	R	2	
	(i) Mean	( <b>ii</b> ) SD			
	(iii) Variance	(iv) Mode			
	(b) The sign of correlation is	as that of the regression coefficients.	1	R	2
	(i) Less	(ii) Greater			
	(iii) Smaller	(iv) Same			
	(c) Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ defined by $T(x_1, x_2)$	1	R	5	
	(i) Reflection	(ii) Projection			
	(iii) Rotation	(iv) Contraction			
	(d) If $T: V \rightarrow W$ , which one of the following the followi	1	R	5	
	(i) ker $(T)$ is a subspace of V	(ii) $R(T)$ is a subspace of W			
	( <b>iii</b> ) Only (ii)	(iv) Both (i) and (ii)			
	(e) For zero transformation $T: V \rightarrow W$		1	U	5
	(i) $\ker(T) \neq \{0\}$	(ii) $\ker(T) = \{0\}$			
	(iii) $\ker(T) = V$	(iv) ker $(T)$ is not defined			
Q.6	Attempt Any Two		[10]		
	(a) Find the mean, median, standard de	viation and Karl Pearson's coefficient of	5	Α	2

skewness for the following probability distribution								
X = x	1	2	3	4	5	6	7	8
p(x)	0.008	0.032	0.142	0.216	0.240	0.206	0.143	0.013

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	(b) Ten participants in a contest are ranked by two judges as follows:	5	A	2
	x 1 3 7 5 4 6 2 10 9 8			
	<u>y 3 1 4 5 6 9 7 8 10 2</u>			
	Calculate the rank correlation coefficient.	_	•	2
	(c) Obtain the two regression lines from the following data and hence, find the	5	Α	2
	correlation coefficients $\begin{bmatrix} r & 6 & 2 & 10 & 4 & 8 \end{bmatrix}$			
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			
Q.7	Attempt Any Two	[10]		
	(a) Fit a straight line $y = a + bx$ to the following data:	5	Α	4
	x 1 2 3 4 6 8			
	y 2.4 3 3.6 4 5 6			
	( <b>b</b> ) Fit a parabola $y = a + bx + cx^2$ to the following data:	5	Α	4
	x 1 2 3 4 5			
	y 5 12 26 60 97			
	(c) Fit a curve of the form $y = ae^{bx}$ to the following data:	5	A	4
	x 1 3 5 7 9			
	y 115 105 95 85 80			
Q.8	Attempt Any Two	[10]		
	(a) Determine whether the function is a linear transformation. Justify your	5	Α	5
	answer.			
	(i) $T: \mathbb{R}^2 \to \mathbb{R}^2$ , where $T(x, y) = (x+2y, 3x-y)$			
	(ii) $T: \mathbb{R}^3 \to \mathbb{R}^2$ , where $T(x, y, z) = (2x - y + z, y - 4z)$			
	(b) Let $T: \mathbb{R}^4 \to \mathbb{R}^3$ be the linear transformation defined by	5	A	5
	$T(x_1, x_2, x_3, x_4) = (4x_1 + x_2 - 2x_2 - 3x_4, 2x_1 + x_2 + x_3 - 4x_4, 6x_1 - 9x_2 + 9x_4)$			
	(i) Find a basis and the dimension for $ker(T)$			
	(ii) Find a basis and the dimension for the $R(T)$ .			
	(iii) Verify the dimension theorem.			
	(c) Determine whether the linear transformation $T: \mathbb{R}^3 \to \mathbb{R}^3$ defined by	5	Α	5
	T(x, y, z) = (x+3y, y, z+2x) is one-to-one, onto, both or neither.			
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