RV College of Engineering

RV College of Engineering
Mysore Road, RV Vidyaniketan Post, Bengaluru - 560059, Karnataka, India

USN

DEPARTMENT OF MATHEMATICS

Academic year 2025-2026 (Odd Semester)

Date: 12th January 2026	**Improvement CIE**	**Max Marks: 10+50**
Time: 9:00 AM to 11:00 AM	**UG**	**Duration: 120 minutes**
Semester: III BE (CD, CI, CS, CY)		
Course Title: LINEAR ALGEBRA AND PROBABILITY THEORY		**Course Code: MA231TC**

- Answer all the questions.
- Marks will not be awarded for direct answers without supporting steps.
- Write answers up to four decimal places.
- Second year Mathematics Handbook for B.E. program is allowed.

Part-A

Q.No.	QUESTIONS	M	CO	BT
1	Given $E[X] = 5$ and $E[X^2] = 27$, then $Var(2X-5) =$_________.	2	1	2
2	A call center receives an average of 2 calls per minute. Assuming the number of calls follows a Poisson distribution, then the probability that at least 1 call received in a given minute is _________.	2	2	1
3	If the joint probability distribution of X and Y is given by $f(x,y) = \frac{x+y}{30}$, $x = 0,1,2,3$ and $y = 0,1,2$, then $P(X > 1 \mid Y = 2) =$_________.	2	2	3
4	If a binomial random variable X has mean 9 and variance 6, then the probability of success $p =$______ and the probability of failure $q =$_______.	2	1	2
5	A random variable X is normally distributed with mean $\mu = 50$. If $P(X < 60) = 0.8413$, then the standard deviation $\sigma =$_________.	2	2	2

Part-B

Q.No.	QUESTIONS	M	CO	BT
1a	Suppose a grocery store purchases 5 cartons of skim milk. Let X be the profit (in dollars) obtained from this lot after sales and distributor credit for unsold cartons. The probability distribution of X is given in the table below. x: -1.5, -0.75, 0.0, 0.75, 1.5, 2.25 $p(x)$: $1/15$, $2/15$, $2/15$, $3/15$, $4/15$, $3/15$ Find i) The probability of at least \$1 profit. ii) Standard deviation of the profit.	5	2	2
1b	Impurities in a batch of final product of a chemical process often reflect a serious problem. From considerable plant data gathered, it is known that the proportion Y of impurities in a batch has a density function given by $f(y) = \begin{cases} 10(1-y)^9 & 0 \le y \le 1 \\ 0 & elsewhere \end{cases}$ i) Verify that the above is a valid density function. ii) A batch is considered not sellable and then not acceptable if the percentage of impurities exceeds 60%. With the current quality of the process, determine the percentage of batches that are not acceptable?	5	3	2

2	The joint distribution of two random variables X and Y is given by: $P(X = x, Y = y) = k(x + y), x = 1,2,3,4; y = 1,2,3$. Find (i) The value of k. (ii) The marginal distributions of X and Y. (iii) Correlation coefficient of X and Y.	10	3	3
3	The fraction X of male runners and the fraction Y of female runners who compete in marathon races are described by the joint density function $f(x,y) = \begin{cases} kxy & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0 & elsewhere \end{cases}$, Find (i) k (ii) $P(X < 0.5,\ Y < 1)$ (iii) $P(X + Y > 1)$ (iv) $P(Y > 0.5)$ (v) Marginal distribution of Y.	10	2	3
4a	Define X as the number of underfilled bottles from a filling operation in a carton of 24 bottles. Seventy-five cartons are inspected and the following observations on X are recorded: Values (X): 0, 1, 2, 3 Frequency: 39, 23, 12, 1 Fit a binomial distribution for the above data and calculate the expected frequencies.	6	3	2
4b	Number of flaws in an electric wire follows a Poisson distribution with mean of 3 flaws per millimeter. Determine the probability of (i) 4 flaws per millimeter of wire (ii) at least 1 flaw per 2 millimeters of wire.	4	2	2
5a	The time between arrivals of taxis at a busy intersection is exponentially distributed with a mean of 10 minutes. (i) Determine the probability that you wait longer than one hour for a taxi (ii) Determine the probability that one has to wait anywhere between half an hour to one hour. (iii) Determine x such that the probability that you wait less than x minutes is 0.50.	6	2	3
5b	A lawyer commutes daily from his suburban home to his midtown office. The average time for a one-way trip is 24 minutes, with a standard deviation of 3.8 minutes. Assume the distribution of trip times to be normally distributed. Determine probability that (i) a trip will take at most 30 minutes (ii) a trip will take between 20 minutes to 40 minutes.	4	2	2

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars	CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Quiz	4	6	-	-	2	6	2	-	-	-
	Test	-	29	21	-	-	24	26	-	-	-

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