PVP 23

Code: 23BS1402

II B.Tech - II Semester – Regular / Supplementary Examinations
APRIL 2026

PROBABILITY AND STATISTICS
(Common for ME, CSE, IT, AIML, DS)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Define sample space and conditional probability.	L1	CO1
1.b)	State the addition law and multiplication law of probability.	L1	CO1
1.c)	Explain variance.	L2	CO2
1.d)	Identify the mean of Poisson distribution, where $p(x = 1) = p(x = 2)$.	L1	CO2
1.e)	Write any two properties of correlation coefficient.	L2	CO2
1.f)	Write any two properties of regression coefficients.	L2	CO2
1.g)	Define critical region.	L1	CO3
1.h)	Define level of significance.	L1	CO3
1.i)	What are the conditions of the validity of chi-square test?	L1	CO3
1.j)	Explain F-test.	L3	CO3

PART – B

<table>
<tr><td></td><td></td><td></td><td>BL</td><td>CO</td><td>Max. Marks</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">UNIT-I</td></tr>
<tr><td>2</td><td colspan="2">The median and mode of the following wage distributions are known to be Rs 33.50 and Rs 34 respectively. Find the values of P, Q, and R.
<table><tr><td>Wages</td><td>0-10</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td><td>50-60</td><td>60-70</td></tr><tr><td>frequency</td><td>4</td><td>16</td><td>P</td><td>Q</td><td>R</td><td>6</td><td>4</td></tr></table></td><td>L2</td><td>CO2</td><td>10 M</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td rowspan="2">3</td><td>a)</td><td>Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same color?</td><td>L3</td><td>CO2</td><td>5 M</td></tr>
<tr><td>b)</td><td>The chance that doctor A will diagnose a disease X correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X, died. What is the chance that his disease was diagnosed correctly?</td><td>L4</td><td>CO4</td><td>5 M</td></tr>
<tr><td colspan="6">UNIT-II</td></tr>
<tr><td rowspan="2">4</td><td>a)</td><td>The mean of Binomial distribution is 3 and the variance is 9/4. Find i) the value of ‘n’
ii) $P(X \geq 7)$ iii) $P(1 \leq X < 6)$</td><td>L3</td><td>CO2</td><td>5 M</td></tr>
<tr><td>b)</td><td>If X is a normal variate with mean 30 and standard deviation 5. Calculate
i) $P(26 \leq X \leq 40)$ ii) $P(X \geq 45)$.</td><td>L4</td><td>CO4</td><td>5 M</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>5</td><td>a)</td><td>A random variable X has the following probability function
<table><tr><td>X</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>P(X)</td><td>k</td><td>2k</td><td>3k</td><td>4k</td><td>5k</td><td>6k</td><td>7k</td><td>8k</td></tr></table>Find (i) k (ii) $P(X \leq 2) and\ P(2 \leq X \leq 5)$</td><td>L3</td><td>CO2</td><td>5 M</td></tr>
</table>

	b)	A car-hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportions of days (i) on which there is no demand (ii) on which demand is refused.	L4	CO4	5 M
UNIT-III					
6	a)	The equation of two regression lines are $7x - 16y + 9 = 0\ and\ 5y - 4x - 3 = 0$. Find the correlation coefficient and the means of x and y	L3	CO4	5 M
	b)	Fit a curve $y = ax^b$ to the following data x: 1, 2, 3, 4, 5, 6 y: 2.98, 4.26, 5.21, 6.10, 6.8, 7.5	L4	CO4	5 M
OR					
7	a)	Following are the ranks obtained by 10 students in two subjects, Statistics and Mathematics. To what extent the knowledge of the students in two subjects is related? Statistics: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 Mathematics: 2, 4, 1, 5, 3, 9, 7, 10, 6, 8	L4	CO4	5 M
	b)	Determine the equation of a straight line of the form $y = a + bx$ that best fits the data. X: 10, 12, 13, 16, 17, 20, 25 Y: 10, 22, 24, 27, 29, 33, 37	L3	CO2	5 M
UNIT-IV					
8	a)	In a random sample of 100 packages shipped by air freight 13 had some damage. Construct 95% confidence interval for the true proportion of damage package.	L3	CO3	5 M
	b)	In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance?	L3	CO5	5 M
OR					
9	a)	A machine puts out 16 imperfect articles in a sample of 500 articles. After the machine is	L2	CO3	5 M

		overhauled it puts out 3 imperfect articles in a sample of 100 articles. Has the machine improved?			
	b)	In a sample of 600 students of a certain college 400 are found to use ball pens. In another college from a sample of 900 students 450 were found to use ball pens. Test whether 2 colleges are significantly different with respect to the habit of using ball pens.	L4	CO5	5 M
		UNIT-V			
10	a)	The average breaking strength of the steel rods is specified to be 18.5 thousand pounds. To test this sample of 14 rods were tested. The mean and standard deviations obtained were 17.85 and 1.955 respectively. Is the result of experiment significant?	L3	CO3	5 M
	b)	A random sample of size 20 from a normal population gives a mean of 42 and a variance of 25. Test the hypothesis that the sample came from a population of mean 40 at 5% level of significance.	L3	CO3	5 M
		OR			
11	a)	Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins, show that the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal.	L4	CO5	5 M
	b)	A sample analysis of examination results of 500 students was made. It was found that 220 students had failed, 170 had secured a third class, 90 were placed in second class and 20 got a first class. Do these figures commensurate with the general examination result which is in the ratio 4:3:2:1 for the various categories respectively.	L4	CO5	5 M