VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024

Continuous Assessment Test –II

Programme Name & Branch: B.Tech

Slot: G2 + TG2 (Common)

Course Name & code: Probability and Statistics & BMAT202L

Exam Duration: 90 Min. **Maximum Marks:** 50

General instruction(s): Answer ALL Questions

(Statistical Tables are allowed)

Q.No.	Question	Max. Marks
1.	Find the linear relation of Sales on Advertisement expenditure and Advertisement expenditure on Sales from the data given below and hence estimate: 1. The Sale for advertising expenditure of $Rs.90$ lakhs 2. The advertisement expenditure for sales of $Rs.45$ crores	10
2.	With usual notation, find p for a binomial random variate X if $n = 6$ and if $9P(X = 4) = P(X = 2)$. Hence find $P(X = 1)$.	10
3.	The height X, of young Indian women is distributed normal with mean $\mu = 65.5$ and standard deviation $\sigma = 2.5$ inches. Find (i) $P(X < 67)$ (ii) $P(64 < X < 67)$ and (iii) $P(X > 65)$.	10
4.	a) A group of cookery students is comparing two methods for preparing a dish: steaming and frying method. They want to know if patrons of their restaurant prefer their frying method over the steaming method. A sample of patrons are given the dish prepared using each method and asked to select their preference. A statistical analysis is performed to determine if more than 50% of participants prefer the new frying method: $H0 : p = 0.50,\ H1 : p > 0.50$	5+5

Sales (Rs.Crores)	13	16	22	20	24	30	35
Adv. Exp. (Rs.Lakhs)	51	64	65	71	76	80	74

	Discuss Type I and Type II error and their consequences for this scenario. b) A Telecom service provider claims that individual customers pay on an average *Rs*. 400 per month with standard deviation of *Rs*. 25. A random sample of 50 customers' bills during a given month is taken with a mean of *Rs*. 250 and standard deviation of *Rs*. 15. Test the hypothesis against the claim made by the service provider. Assume LOS 1%.	
5	Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same or not. Assume 5% LOS.	10

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024

Continuous Assessment Test –II

Programme Name & Branch : **B.Tech**

Slot : **D1+TD1 (Common)**

Course Name & Code : **Probability and Statistics & BMAT202L**

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): Answer ALL Questions

(Statistical Table is to be permitted)

Q.No	Question	Max Marks
1.	Obtain the equations of the regression lines from the following data. Also estimate the values of (i) Y, when X=38 and (ii) values of X, when Y=18.	10
2.	In a certain factory producing razor blades, there is a small chance 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing (i) no defective blade, (ii) at least one defective blade and (iii) at most 1 defective blade in a consignment of 10000 packets.	10
3.	The lifetime X (in hundreds of hours) of a certain type of vacuum tube has a Weibull distribution with parameters $\alpha=2$ and $\beta=3$. Compute the following: (i) E(X) and Var(X), (ii) $P(X\leq 6)$, (iii) $P(1.8\leq X\leq 6)$ and (iv) $P(X\geq 3)$.	10
4.	A random sample of 100 recorded deaths in the United States during the past year showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years, does this seem to indicate that the mean life span today is greater than 70 years at 0.05 level of significance.	10
5.	In a referendum submitted to the student body at a university, 850 men and 566 women voted. 530 of the men and 304 of the women votes yes. Does this indicate a significant difference of the opinion on the matter between men and women students?	10

X	22	26	29	30	31	31	34	35
Y	20	20	21	29	27	24	27	31

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2022-2023

Continuous Assessment Test –II

Programme Name & Branch : B.Tech

Slot: D2+TD2 (Common)

Course Name & code: Probability and Statistics BMAT202L

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): Answer ALL Questions

(Table or Charts are to be permitted)

Q.No.	Question	Max Marks	CO	BL
1	A researcher is studying the relationship between sleep duration (in hours) and academic performance (GPA) for a group of 20 students. They collect the following data:	10	CO3	BL5

Student	1	2	3	4	5	6	7	8	9
Sleep duration	4	7	8	9	6	6.5	7.5	4.5	8.5
GPA	8	9	9.5	8.5	8	7	5	6	6.5

Are the sleep duration and GPA of the students consistent?

2.	(a) A machine produces identical units. The proportion of defective units produced by the machine is known to be 1/20. We also know that successive units are statistically independent. Obtain the probability that in a sample of 10 units, there are at most 2 defectives. (b) The probability that a person recovers from a serious	10	CO3	BL3

	disease is 0.40. Find the probability that at least one of the 8 persons admitted to a hospital will survive.			
3.	The height of female students at a University follows approximately a normal distribution, with mean 60 inches and standard deviation 2. Find the probability that a female student selected at random has height a) less than 58 inches b) between 58 inches and 62 inches.	10	CO3	BL3
4.	It is seen that 17.26% people lost their money in the stock market. In a certain year 640 people invested in a stock and 63 persons lost their money. Can the stock be considered as believable at 1% level of significance (LOS)? What about at 5% LOS?	10	CO4	BL3
5.	A bakery claims their new muffins have an average diameter of 5 centimetres (cm) with a standard deviation of 0.5 cm. You suspect the muffins might be smaller. To investigate this, you randomly sample 49 muffins and measure their diameters. The average diameter of your sample is 4.8 cm. Determine if there's enough evidence to suggest the bakery's claim (average diameter of 5 cm) is inaccurate at a 5% significance level. What about 1% level of significance?	10	CO4	BL4

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024

Continuous Assessment Test –II

Programme Name & Branch: B.Tech

Slot: B1+TB1 (Common)

Course Name & code: Probability and Statistics & BMAT202L

Exam Duration: 90 Min. **Maximum Marks:** 50

General instruction(s): Answer ALL Questions

(Use of statistical table is allowed)

Q.No.	Question	Max Marks	CO	BL
1.	The following table gives the test scores made by ten sales man on an intelligent test and the values of their weekly sales: Salesman: A B C D E F G H I J Test scores: 40 70 50 60 80 50 90 40 60 60 Sales (in thousands): 2.5 6.0 4.5 5.0 4.5 2.0 5.5 3.0 4.5 3.0 Obtain the regression equation of sales on test scores. Also estimate the most probable value of weekly sales for a salesman whose test score is 70.	10	CO3	BL2
2.	The probability of a man scoring a penalty in a Hockey match is $\frac{1}{3}$. How many times he should be given a chance so that the probability of scoring successfully at least once is greater than $\frac{3}{4}$.	10	CO2	BL3
3.	If the number of kilometers that a car can run before its battery wears out is exponentially distributed with an average value of 10,000 km and if the owner desires to take a 5000 km trip, what is the probability that he will be able to complete the trip without having to replace the car battery? Assume that the car has been used for some time. What is the probability, when the distribution is not exponential?	10	CO2	BL3
4.	A cool drinks manufacturing company claims that its brand A cool drinks outsells its brand B by 8%. It is found that 42 out of a sample of 200 people prefer brand A and 18 out of another sample of 100 people prefer brand B. Test at 10% level of significance, whether the	10	CO4	BL3

	8% difference is a valid claim.			
5.	Two samples drawn from two different populations gave the following results: Sample | Size | Mean | SD I | 400 | 124 | 14 II | 250 | 120 | 12 Test the significance of the difference between the means of the samples and also find the 99% confidence limits.	10	CO4	

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2022-2023

Continuous Assessment Test –II

Programme Name & Branch: B. Tech (Common)

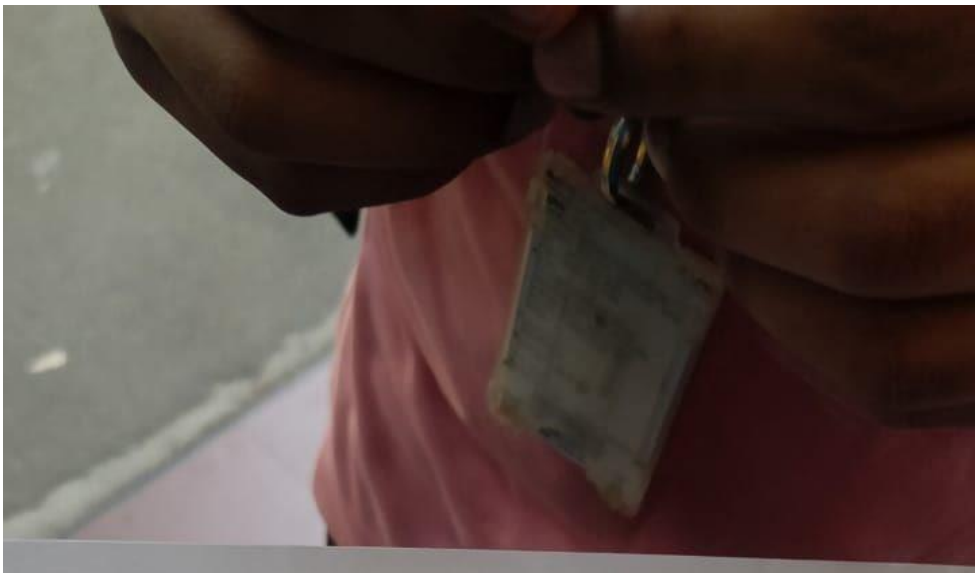
Slot: B2+TB2

Course Code & Name: BMAT202L - Probability and Statistics

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): Answer ALL Questions

Q. No.	Question	Max Marks	CO	BL
1.	The sale of a product in lakhs of rupees(Y) is expected to be influenced by two variables namely the advertising expenditure(X_1)(in thousands of rupees) and the number of sales persons(X_2) in a region. Sample data on 8 regions of a state has given the following results: Area: 1 2 3 4 5 6 7 8 Y: 105 95 80 115 135 100 95 125 X_1: 20 33 38 25 28 24 27 33 X_2: 13 15 7 9 6 12 14 11 Find the regression model.	10	CO3	BL5
2.	Let an irregular 6-faced die is thrown and the possibility that in 10 throws it will give 5 even numbers is twice the expectation that it will give 4 even numbers. Out of 10,000 sets of 10 throws, find the number of times you should expect to receive (i) no even numbers, (ii) at least 15 even numbers and (iii) at most 3 even numbers.	10	CO2	BL3
3.	Assume that there were 200 students participated in an annual examination in a school. As a result, their respective average score and standard deviation are 32 and 13. (i) How many candidates can be expected to obtain marks between 35 and 75 assuming the normality of the distribution and (ii) determine the limit of the marks of the central 60 % of the candidates.	10	CO2	BL2



4.	A company wants to improve the quality of products by reducing defects and monitoring the efficiency of assembly lines. In assembly line A, there were 22 defects reported out of 400 samples while in line B, 33 defects out of 800 samples were noted. Is there a difference in the procedures at α=2% LOS?	10	CO4	BL3
5.	a) A sample of 200 students is taken from a large population. The mean height of the students in this sample is 135cm. Can it be reasonably regarded that this sample is from a population of mean 135 cm and S.D 8 cm? Also find the 95% fiducial limits for the mean. b) A genetic experiment involving peas yielded one sample of offspring consisting of 334 green peas and 143 yellow peas. Use a 0.01 significance level to test the claim that under the same circumstances, 18% of offspring peas will be yellow. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. Use the P-value method.	(5+5)	CO4	BL4

VIT
Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024 **Continuous Assessment Test –I**

Programme Name & Branch : B.Tech(common) **Slot : G1+TG1**

Course Name : Probability and Statistics **Course Code : BMAT202L**

Exam Duration: 90 Min. **Maximum Marks: 50**

Answer ALL Questions(5x10=50 Marks)

1. Find the value of Mean, Median and Mode from the data given below

Weight(kg)	20-40	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
No of Students :	8	12	20	30	40	35	18	7	5

2. The scores of two bats man A and B in a series of matches are as follows:

A : 37 43 28 62 59 20 83 48 52 47

B : 35 52 77 38 26 58 63 31 40 46

Which of the two batsman do you consider the more consistent and more efficient?

3a) A discrete random variable has the following probability distribution

x	0	1	2	3	4	5	6	7	8
p(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

(i) Find the value of a (ii)Find $P(x \geq 7)$ (iii) Find $P(3 < x < 7/x > 5)$

b) A lot containing 7 components is sampled by a quality inspector; the lot contains 4 good and 3 defective components. A sample of 3 is taken by the inspector. Find the expected value of number of good components in the sample.

4. Two electronic components of a missile system work in harmony for the success of the total system. Let X and Y denote the life in hours of the two components. The joint density of X and Y is

$$f(x,y) = \begin{cases} ye^{-y(1+x)} & x, y \geq 0 \\ 0, & elsewhere \end{cases}$$

(i) Give the marginal density functions for both random variables.

(ii) What is the probability that the lives of both components will exceed 2 hours?

5. Calculate the correlation coefficient between X and Y

X: 22 53 46 67 43 35 88 11 95 13

Y: 18 39 31 42 55 64 82 10 96 14

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024

Continuous Assessment Test – I

Programme Name & Branch: B.Tech

Slot: D2+TD2

Course Name & code: Probability and Statistics- BMAT202L

Class Number (s): VL2023240501665, VL2023240502291, VL2023240501744, VL2023240501662, VL2023240502275, VL2023240502278

Faculty Name (s): MURUGAN V , GOURANGA MALLIK, PADMA R, DEBAROTI DAS, POORNIMA T, RAMU G, DHARANI S.

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): Answer all questions 5×10=50

Q.No.	Question	Max Marks	CO	BL
1	Calculate the mean, median and mode for the following distribution.	10	CO1	BL3

Marks	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of students	8	87	190	304	211	85	20

2	Find the coefficient of mean deviation from mean, coefficient of variation for the following data.								10	CO1	BL3

x	0	1	2	3	4	5	6	7	8
f	4	36	100	232	280	204	112	28	4

3	Let X and Y be two random variables having the joint probability mass function $f(x,y)=\frac{1}{27}(2x+y)$ where x and y can assume only the integer values 0, 1, 2. (i) Find all marginal distributions and means of X and Y. (ii) Determine the value of $P[X \le 1 / Y=1]$ and $P[X \ge 1, Y<2]$								10	CO2	BL3

	Let X and Y have the joint probability density function $f(x,y)=\begin{cases} x^2+\frac{xy}{3}, 0\le x\le 1,\ 0\le y\le 2 \\ 0, \quad otherwise \end{cases}$ Then find (i) $P\left(X>\frac{1}{2}\right)$ (ii) $P(Y<X)$ (iii) $P\left(Y<\frac{1}{2}/X<\frac{1}{2}\right)$	10	CO2	BL3
	Calculate the Karl-Pearson's coefficient of correlation for the following percentage of marks in Economics (E) and Statistics (S)	10	CO3	BL2

S.No	1	2	3	4	5	6	7	8	9	10
E	78	36	98	25	75	82	90	62	65	39
S	84	51	91	60	68	62	86	58	53	47

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024

Continuous Assessment Test – I

Programme Name & Branch : B.Tech

Slot: D1+TD1

Course Name & code: Probability and Statistics & BMAT202L

Class Number (s): VL2023240501672/1745/1670/2282/2299/1664/1661

Exam Duration: 90 Min. **Maximum Marks: 50**

Answer ALL Questions

(Only calculator is to be permitted)

Q.No	Question	Max Marks
1.	Calculate the missing frequency X and median for the following data: No. of pills / No. of people cured 4 – 8 : 11 8 – 12 : 13 12 – 16 : 16 16 – 20 : 14 20 – 24 : X 24 – 28 : 9 28 – 32 : 17 32 – 36 : 6 36 – 40 : 4 Given that the average number of pills to cure a person is 20.	10

2. Calculate the Quartile deviation and the Standard deviation of the number of children in 35 families for the following data: — 10

No. of children	0	1	2	3	4	5
No of families	2	3	10	15	4	1

3. A random variable X has probability density function — 10

$$f(x) = \begin{cases} kx^2e^{-3x} & , \ x > 0 \\ 0 & , \ x \leq 0 \end{cases}$$

Find (i) the constant k
(ii) P(1 < X < 2)
(iii) P(X ≥ 3)
(iv) P(X < 1)

4. The joint probability mass function of two random variables X and Y is specified as follows, — 10

$P[X = x, Y = y] = k(2x + 3y), \quad x = 1,2 \ ; y = 0,1,2.$

Obtain (i) the constant k.
(ii) the marginal probability distribution of X.
(iii) the conditional probability of Y given X = 1.
(iv) P(X > 1, Y < 2).
(v) Check whether X and Y are independent or not.

5. A sample of 10 fathers and their sons gave the following data about their heights in inches: — 10

Father X	65	63	67	64	68	62	70	66	68	67
Son Y	68	66	68	65	69	66	68	65	71	67

Calculate the correlation coefficient of X and Y and comment on the result.

VIT
Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES
Winter Semester 2023-2024
Continuous Assessment Test –I

Programme Name & Branch : B. Tech
Slot : B2 + TB2 + TBB2
Course Name & code : Probability and Statistics & BMAT202L
Exam Duration : 90 Min. **Maximum Marks: 50**

Answer ALL Questions

Q.No	Question	Max Marks
1.	Find mean, median and mode for the following data:	10

Class interval	150-154	155-159	160-164	165-169	170-174	175-179	180-184
Frequency	10	11	11	10	7	6	6

2. Life of bulbs produced by two factories A and B are given below: — 10

Length of life (in hours)	550-650	650-750	750-850	850-950	950-1050
Factory A(No. of bulbs)	10	22	52	20	16
Factory B(No. of bulbs)	8	60	24	16	12

Find quartile deviation of A and B and then find its coefficients to know the bulbs of which factory are more consistent from the point of view of the length of life?

3. The probability density function of a random variable X is given by — 10

$$f_X(x) = \begin{cases} x, & 0 < x < 1 \\ k(2-x), & 1 \le x \le 2 \\ 0, & \text{otherwise} \end{cases}$$

(i) Find the value of k,
(ii) Find $P(0.2 < x < 1.2)$,
(iii) What is $P[\ 0.5 < x < 1.5 \,/\, x \ge 1\ ]$?
(iv) Find the distribution function of $f_X(x)$.

4. Find all the marginal and conditional distributions for the following table which represents the joint probability distribution of the discrete random variable (X, Y). 10

Y \ X	1	2	3
1	$\frac{1}{12}$	$\frac{1}{6}$	0
2	0	$\frac{1}{9}$	$\frac{1}{5}$
3	$\frac{1}{18}$	$\frac{1}{4}$	$\frac{2}{15}$

5. Find the correlation coefficient between the two subjects: Mathematics and Statistics. The marks obtained by 10 students in those subjects are given below: 10

Marks in Mathematics	75	30	60	80	53	35	15	40	38	48
Marks in Statistics	85	45	54	91	58	63	35	43	45	44

VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2023-2024

Continuous Assessment Test –I

Programme Name & Branch: B.Tech.

Slot: B1+TB1

Course Name & code: Probability and Statistics; BMAT202L

Class Number (s): VL2023240501677

Exam Duration: 90 Min. **Maximum Marks:** 50

General instruction(s): Answer ALL Questions

Q. No.	Question	Max Marks	CO	Bl
1.	In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contained varying number of mangoes. The following was the distribution of mangoes according to the number of boxes.	10	CO1	BL Bl

Number of Mangoes	170-180	180-190	190-200	200-210	210-220	220-230	230-240	240-250
Number of Boxes	52	68	85	92	100	95	70	28

Find the mean, median and mode number of mangoes kept in a packing box.

2.	Following are the observations showing the one-day sales of a shopping mall, where we determine the frequency of the first 50 customers of different age groups.	10	CO1	B E

Age in Years	40-44	45-49	50-54	55-59	60-64	65-69
No. of Customers	5	8	11	10	9	7

For the given data, find the quartile deviation, standard deviation and hence compare your results for better dispersion measurement.

3.	The joint probability density function of two random variables (X, Y) is given by $f_{XY}(x,y) = \begin{cases} cx(x-y), & 0 < x < 2;\ -x < y < x \\ 0 & \text{elsewhe} \end{cases}$ (a) Determine the value of c. (b) Find the marginal distribution for X and marginal distribution for Y. (c) Evaluate $f_{Y/X}(y/x)$.	10	CO2	
4.	The joint probability mass function of (X,Y) is given by p(x,y)=k(2x+3y), x=0,1,2; and y=1,2,3. Find the marginal distribution for X and Y. Find the conditional probability distribution of X, given Y=1. Also find the probability distribution of (X+Y).	10	CO2	
5.	A sample of 12 fathers and their eldest sons gave the following data about their height in inches: Father : 65 63 67 64 68 62 70 66 68 67 69 71 Son : 68 66 68 65 69 66 68 65 71 67 68 70 Calculate correlation coefficient for the above data.	10	CO2