Reg.No.:

Name:

VIT
Vellore Institute of Technology

Continuous Assessment Test (CAT-I) – September 2023

Programme	:	B.TECH	Semester	:	Fall 2023-24
Course	:	Probability and Statistics	Code	:	BMAT202L
Faculty	:	Dr. G Y Mythili	Slot & Class ID	:	F2+TF2 CH2023240101042
Time	:	90 minutes	Max. Marks	:	50

Q. No.	Answer All Questions (5 X 10 = 50 Marks)
1.	Calculate the first four moments about the mean and analyse the distribution. X: 0, 1, 2, 3, 4, 5, 6, 7, 8 f: 1, 8, 28, 56, 70, 56, 28, 8, 1
2.	The prices of 2 commodities over 10 weeks are given below. Find out which price shows less variation. A: 54, 55, 53, 56, 52, 52, 58, 49, 50, 51 B: 108, 107, 105, 106, 105, 103, 102, 104, 104, 101
3.	Given the following table. X: -3, -2, -1, 0, 1, 2, 3 p(x): 0.05, 0.1, 0.3, 0, 0.3, 0.15, 0.1 Compute (i) $E(X)$ (ii) $E(2X \pm 3)$ (iii) $P(X < 2)$ (iv) $P(-2 < X < 2)$ (v) $V(X)$ (vi) $V(2X \pm 3)$
4.	(i) Find the rank correlation coefficient from the following data. Rank in X: 1, 2, 3, 4, 5, 6, 7, 8, 9 Rank in Y: 4, 3, 8, 1, 2, 9, 6, 5, 7 (ii) For a trivariate distribution, the following correlation coefficient were obtained $r_{12} = 0.57, r_{13} = 0.65, r_{23} = 0.41$. Find the partial correlation coefficient $r_{23.1}$ and multiple correlation coefficient $R_{2.13}$.
5.	A research investigator collected data on savings and investment from 16 house-holds. Savings showed a mean of Rs. 6565.00 and a variance of Rs. 250.00. As against this, mean investment was found at Rs.4525.00 and variance as Rs.520.00. If the coefficient of correlation between savings and investment is 0.67, find the most approximate value of savings against an investment of Rs.9000 and that of investment against a savings of Rs.5600.

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CHENNAI

Reg. Number:	22BCE1351

Continuous Assessment Test (CAT) - I - February 2024

Programme	:	B. Tech.	Semester	:	Winter
Course Code & Course Title	:	BMAT202L (Probability and Statistics)	Slot	:	C1+TC1
Faculty	:	Dr Prabhakar V. Dr Harshavarthini S.	Class Number	:	CH2023240500894 CH2023240500895
Duration	:	90 Minutes	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted.

Answer all questions.

Q. No	Sub Sec.	Description	Marks
1.		Calculate the Median and Mode of the data given in the following table.	5+5

Class interval	9.5-14.5	14.5-19.5	19.5-24.5	24.5-29.5	29.5-34.5	34.5-39.5	39.5-44.5
Frequency	10	15	17	25	18	12	8

Q. No	Sub Sec.	Description	Marks
2.		The weekly salaries of a group of employees are given in the following table. Find the mean and standard deviation of the salaries.	10

Salary (In Rs.)	75	80	85	90	95	100
No. of persons	3	7	18	12	6	4

3. For the random variables X and Y, we define

$$p(x,y) = P(X = x, Y = y) = \begin{cases} k(x+y), & for\ x = 1,2,3,4\ and\ y = 1,2,3 \\ 0, & Otherwise \end{cases}$$

Find **[10]**

(i) the value(s) of k, such that $p(x,y)$ will be a joint PMF. [2]
(ii) both the marginal PMFs. [3]
(iii) both the conditional distributions. [3]
(iv) $P(X+Y<4)$ [2]

4. The joint probability density function (PDF) of the random variables X and Y is defined as:

$$f(x,y) = \begin{cases} k(6-x-y), & for\ 0 < x < 2\ and\ 2 < y < 4 \\ 0, & Otherwise \end{cases}$$

Find **[10]**

(i) the value(s) of k, such that $f(x,y)$ will be a joint PDF. [2]
(ii) Justify whether X and Y are independent or not. [5]
(iii) $P(X+Y<3)$ [3]

5.	(a) (½)	Suppose X is a discrete random variable and has the moment generating function (MGF) $M_X(t) = \frac{1}{5}e^t + \frac{2}{5}e^{3t} + \frac{2}{5}e^{6t}$. Hence find the corresponding probability mass function (PMF) of X. And also find the $\boxed{E(X)}$ by using the given MGF. $= (\mu_1{}')$	5
	(b)	Suppose Y is random variable with the probability density function $f_Y(y) = \begin{cases} \frac{1}{3}, & -1 < y < 2 \\ 0, & otherwise \end{cases}$. Find the cumulative distribution function (CDF) and the MGF.	2+3

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Reg. Number: 22BCE1335

Continuous Assessment Test (CAT) - I - February 2024

Programme	:	B. Tech.	Semester	:	Winter
Course Code & Course Title	:	BMAT202L (Probability and Statistics)	Slot	:	C2+TC2
Faculty	:	Prof. Vignesh R. Dr Saroj Kumar Dash	Class Number	:	CH2023240500898 CH2023240503420
Duration	:	90 Minutes	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted.

Answer all questions.

Q. No	Sub Sec.	Description	Marks
1.	(a)	A frequency table with missing data is given here. Find these missing data, so that the arithmetic mean will be 1.46.	5

0	1	2	3	4	5	Total
46	?	?	25	10	5	200

Q. No	Sub Sec.	Description	Marks
	(b)	Calculate the arithmetic mean for the following data:	5

Class	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Frequency	2	4	9	11	12	6	4	2

Q. No	Sub Sec.	Description	Marks
2.		Find the standard deviation for the following data giving wages of 230 persons.	10

x	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150
No. of persons	12	18	35	42	50	45	20	8

Q. No	Sub Sec.	Description	Marks
3.		A random variable X has the following probability distribution:	10

$$f_X(x) = \begin{cases} k^2 x(x-1), & x \in (1,2) \\ 0, & otherwise \end{cases}.$$

Find

(i) the value(s) of k, such that the probability distribution will be the property density function (PDF). [3]

(ii) $P(X \leq 6)$. [3]

(iii) The minimum value of b such that $P(X \leq b) > \frac{1}{2}$. [4]

4.		Let X and Y be two random variables with the joint probability distribution: $$f(x,y) = \begin{cases} k(x+y-3xy^2), & for\ \ 0<x<1\ \ and\ \ 0<y<1 \\ 0, & Otherwise \end{cases}.$$ Hence find: (i) the value(s) of k such that the $f(x,y)$ will be a joint PDF. [2] (ii) both the marginal PDFs. [3] (iii) both the conditional density functions. [3] (iv) justify whether X and Y are independent or not. [2]	10
5.	(a)	Let X be a random variable with moment generating function (MGF) $M_X(t) = (1/2)(1+e^t)$. Derive the variance of X.	5
	(b)	Let Y be a random variable with the probabilities defined as: $P(Y=2)=\frac{1}{7}$, $P(Y=3)=\frac{3}{7}$, $P(Y=5)=\frac{2}{7}$, $P(Y=8)=\frac{1}{7}$, and $P(Y=y)=0$ for y $\in (-\infty,\infty)-\{2,3,5,8\}$. Find the MGF of Y. And hence find the $E(Y)$ by using this MGF.	5

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22BPS1102

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Continuous Assessment Test I - August 2024

Programme : B.Tech	Semester : Fall 2024-25
Course : Probability and Statistics	Code : BMAT202L
	Slot : E1+TE1
Faculty : Dr.Amit Kumar Rahul Dr.B.Jaganathan Dr.S.Devi Yamini Dr.Sethukumarasamy K Dr.Manimaran J Dr.Dhivya M	Class ID : CH2024250102209 CH2024250102210 CH2024250102211 CH2024250102212 CH2024250102213 CH2024250102214
Time : 90 Minutes	Max.Marks : 50 Marks

1. *Find the mean, median, third quartile of the following distribution:* [10]

Class	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Frequency	8	15	39	47	52	41	28	16	4

2. *An incomplete distribution is given below:* [10]

Class Interval	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$	$60-70$
Frequency	10	20	?	40	?	25	15

the median is 35, and the total frequency is 170. Find the missing frequencies.

3. (a) The mileage (in thousands of miles) obtained by car owners using a certain type of tire is represented by a random variable with the following probability density function (PDF):**(5 Marks)** [10]

$$f(x) = \frac{1}{20}e^{-x/20}, \text{ for } x > 0$$
$$= 0, \text{ for } x \le 0$$

Find the probabilities that one of these tyres will-last
(i) at most 10,000 miles.**(1 Mark)**
(ii) anywhere from 16,000 to 24,000 miles.**(2 Marks)**
(iii) at least 30,000 miles.**(1 Mark)**

(b) The joint density function of random variables X and Y is given by:

$$f(x,y) = \begin{cases} e^{-x-y} & ; x \ge 0, y \ge 0 \\ 0 & ; \text{ elsewhere} \end{cases}$$

find $P(X > 1), E(X), E(Y), E(XY), E(X+Y)$ Check whether X and Y are independent or not? **(5 Marks)**

. The applications for a post were interviewed by the personnel manager and the training manager. H was placed first by the personnel manager followed by F, D, B, I, C, J, G, A and E in that order. The training manager placed F first followed by D, H, I, C, B, A, J, E and G in that order. Calculate the value of Spearman's rank correlation coefficient. Interpret the value obtained. [10]

6. A security check at an airport has two express lines. Let X and Y denote the number of customers in the first and second line at any given time. The joint probability function of X and Y is summarized by the following table [10]

X \ Y	0	1	2	3
0	0.1	0.2	0	0
1	0.2	0.25	0.05	0
2	0	0.05	0.05	0.025
3	0	0	0.025	0.05

(i) Find the marginal function of X and Y. **(2 Marks)**
(ii) Find the probability that more than two customers are in line. **(2 Marks)**
(iii) Find $P(|x-y|=1)$ **(5 Marks)**
(iv) Check whether X and Y independent? **(1 Mark)**