



VIT[®]

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

REG.NO.:

**SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2024-2025**

SLOT: B2+TB2

Programme Name & Branch : B Tech.
Course Code and : BMAT202L
Course Name : Probability and Statistics
Exam Duration : 90 minutes **Maximum Marks: 50**

General instruction(s): Answer All Questions

Q. No	Question	M	CO	BL																				
1.	<p>Given the following frequency distribution of earners by daily in a company.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Earns</td> <td>57.5-62.5</td> <td>62.5-67.5</td> <td>67.5-72.5</td> <td>72.5-77.5</td> <td>77.5-82.5</td> <td>82.5-87.5</td> <td>87.5-92.5</td> <td>92.5-97.5</td> </tr> <tr> <td>No. of worker</td> <td>4</td> <td>5</td> <td>31</td> <td>39</td> <td>114</td> <td>30</td> <td>25</td> <td>2</td> </tr> </table> <p>Calculate from the data the (i) mean, (ii) median and (iii) mode.</p>	Earns	57.5-62.5	62.5-67.5	67.5-72.5	72.5-77.5	77.5-82.5	82.5-87.5	87.5-92.5	92.5-97.5	No. of worker	4	5	31	39	114	30	25	2	10	1	1		
Earns	57.5-62.5	62.5-67.5	67.5-72.5	72.5-77.5	77.5-82.5	82.5-87.5	87.5-92.5	92.5-97.5																
No. of worker	4	5	31	39	114	30	25	2																
2.	<p>For the following open-ended data, calculate the Quartile Deviation and its coefficient. Also find the standard deviation.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Marks</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> </tr> <tr> <td>No. of students</td> <td>10</td> <td>20</td> <td>30</td> <td>50</td> <td>40</td> <td>30</td> </tr> </table>	Marks	0-10	10-20	20-30	30-40	40-50	50-60	No. of students	10	20	30	50	40	30	10	1	1						
Marks	0-10	10-20	20-30	30-40	40-50	50-60																		
No. of students	10	20	30	50	40	30																		
3.	<p>A discrete random variable X has the following probability distribution:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>x</td> <td>0</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>f(x)</td> <td>a</td> <td>3a</td> <td>5a</td> <td>7a</td> <td>9a</td> <td>11a</td> <td>13a</td> <td>15a</td> <td>17a</td> </tr> </table> <p>(i) Find the value of a, (ii) Find P {X < 3}. (iii) Find the cumulative distribution function of X and (iv) Evaluate the mean of X.</p>	x	0	1	2	3	4	5	6	7	8	f(x)	a	3a	5a	7a	9a	11a	13a	15a	17a	10	2	2
x	0	1	2	3	4	5	6	7	8															
f(x)	a	3a	5a	7a	9a	11a	13a	15a	17a															
4.	<p>The joint probability density function of two random variables (X, Y) is given by</p> $f_{XY}(x, y) = \begin{cases} cx(x - y), & 0 < x < 2; -x < y < x \\ 0 & \text{elsewhere} \end{cases}$ <p>(a) Determine the value of c. (b) Find the marginal distribution for X. (c) Evaluate $f_{Y/X}(y/x)$.</p>	10	2	3																				
5.	<p>A computer while calculating the correlation coefficient between two variables X and Y from 25 pairs of observations obtained the following results: n=25, $\sum X = 125$, $\sum X^2 = 650$, $\sum Y = 100$, $\sum Y^2 = 460$, $\sum XY = 508$. If was, however, later discovered at the time of checking that he had copied down two pairs as</p> <table border="1" style="width: 50%; border-collapse: collapse; text-align: center;"> <tr><td>X</td><td>Y</td></tr> <tr><td>6</td><td>14</td></tr> <tr><td>8</td><td>6</td></tr> </table> <p>while the correct values were</p> <table border="1" style="width: 50%; border-collapse: collapse; text-align: center;"> <tr><td>X</td><td>Y</td></tr> <tr><td>8</td><td>12</td></tr> <tr><td>6</td><td>8</td></tr> </table> <p>Obtain the correct value of correlation coefficient.</p>	X	Y	6	14	8	6	X	Y	8	12	6	8	10	2	3								
X	Y																							
6	14																							
8	6																							
X	Y																							
8	12																							
6	8																							

BMAT202L Prob. & Stat. Key B2 slot, winter 24-25

1. Mean= 79.08, Median = 79.5175, Mode = 79.8585
2. InterQuartile range = $Q_3 - Q_1 = 46.25 - 25 = 21.25$

$$\text{Quartile deviation} = \frac{Q_3 - Q_1}{2} = \frac{46.25 - 25}{2} = \frac{21.25}{2} = 10.625 \text{ (Semi-InterQuartile range)}$$

$$\text{Coefficient of Quartile deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{46.25 - 25}{46.25 + 25} = \frac{21.25}{71.25} = 0.2982$$

Population SD= 14.1421, Sample SD= 14.1816

3. (i) $a=1/81$, and (ii) $P\{X < 3\}=1/9$, mean= $148/27$

1. $F(0) = \frac{1}{81}$

2. $F(1) = \frac{1}{81} + \frac{3}{81} = \frac{4}{81}$

3. $F(2) = \frac{1}{81} + \frac{3}{81} + \frac{5}{81} = \frac{9}{81}$

4. $F(3) = \frac{1}{81} + \frac{3}{81} + \frac{5}{81} + \frac{7}{81} = \frac{16}{81}$

5. $F(4) = \frac{1}{81} + \frac{3}{81} + \frac{5}{81} + \frac{7}{81} + \frac{9}{81} = \frac{25}{81}$

6. $F(5) = \frac{1}{81} + \frac{3}{81} + \frac{5}{81} + \frac{7}{81} + \frac{9}{81} + \frac{11}{81} = \frac{36}{81}$

7. $F(6) = \frac{1}{81} + \frac{3}{81} + \frac{5}{81} + \frac{7}{81} + \frac{9}{81} + \frac{11}{81} + \frac{13}{81} = \frac{49}{81}$

8. $F(7) = \frac{1}{81} + \frac{3}{81} + \frac{5}{81} + \frac{7}{81} + \frac{9}{81} + \frac{11}{81} + \frac{13}{81} + \frac{15}{81} = \frac{64}{81}$

9. $F(8) = \frac{1}{81} + \frac{3}{81} + \frac{5}{81} + \frac{7}{81} + \frac{9}{81} + \frac{11}{81} + \frac{13}{81} + \frac{15}{81} + \frac{17}{81} = \frac{81}{81} = 1$

X	0	1	2	3	4	5	6	7	8
$P(X)$	$\frac{1}{81}$	$\frac{3}{81}$	$\frac{5}{81}$	$\frac{7}{81}$	$\frac{9}{81}$	$\frac{11}{81}$	$\frac{13}{81}$	$\frac{15}{81}$	$\frac{17}{81}$
$F(X)$	$\frac{1}{81}$	$\frac{4}{81}$	$\frac{9}{81}$	$\frac{16}{81}$	$\frac{25}{81}$	$\frac{36}{81}$	$\frac{49}{81}$	$\frac{64}{81}$	$\frac{81}{81} = 1$

4. (a) $c=1/8$, (b) $f_X(x) = \begin{cases} \frac{x^3}{4}, & \text{in } 0 < x < 2 \\ 0, & \text{elsewhere} \end{cases}$ (c) $f_Y\left(\frac{y}{x}\right) = \frac{1}{2x^2}(x-y), -x < y < x$
5. $\sum X = 125, \sum X^2 = 650, \sum Y = 100, \sum Y^2 = 436, \sum XY = 520$. Mean(X)=5, Mean(Y)=4, Cov(X,Y)=4/5, Sigma(X)^2=1, Sigma(Y)^2=36/25, r(X,Y)=2/3=0.67