



VIT

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

Vellore – 632014, Tamil Nadu, India
DEPARTMENT OF MATHEMATICS
SCHOOL OF ADVANCED SCIENCES
WINTER SEMESTER – 2022~2023

CONTINUOUS ASSESSMENT TEST – I

Programme Name & Branch : B.Tech
 Course Code : BMAT202L
 Course Name : PROBABILITY AND STATISTICS
 Slot : B2+TB2
 Date of the Examination : 23.01.2023
 Duration : 90 minutes

Time: 2.00 -3.30 PM
Max. Marks : 50

General instruction(s):

Answer ALL the Questions (5 X 10 = 50)

1. Compute the mean, median, mode, standard deviation and variance for the following frequency distribution.

Marks :	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000	7000-8000
No. of Students:	6	10	15	22	13	7	3

2. From the following data find quartile deviation and its coefficient.

Class Interval	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Frequencies	8	10	12	15	10	7	8	5

3. A random variable 'X' has the following probability function

Value of X	x	0	1	2	3	4	5	6	7
	P(x)	0	k	2k	2k	3k	k ²	2k ²	7k ² + k

- (i) Find k
 (ii) Evaluate $P(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$
 (iii) If $P(X \leq k) > \frac{1}{2}$, Find the minimum value of k and determine the distribution function of X.

4. Let X and Y be two jointly continuous random variables with joint PDF

$$f_{X,Y}(x, y) = \begin{cases} 6xy, & 0 \leq x \leq 1, \quad 0 \leq y \leq \sqrt{x} \\ 0, & \text{Otherwise} \end{cases}$$

- (i) Find $f_X(x)$ and $f_Y(y)$.
 (ii) Are X and Y independent?
 (iii) Find the conditional PDF of X given $Y=y$, $f_{X|Y}(x|y)$.
 (iv) Find $E[X|Y=y]$, for $0 \leq y \leq 1$
 (v) Find $\text{Var}(X|Y=y)$, for $0 \leq y \leq 1$.

5. From following information find the correlation coefficient between advertisement expenses and sales volume using Karl Pearson's coefficient of correlation method.

Firm	1	2	3	4	5	6	7	8	9	10
Advertisement Exp. (Rs. In Lakhs)	11	13	14	16	16	15	15	14	13	13
Sales Volume (Rs. In Lakhs)	50	50	55	60	65	65	65	60	60	50

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Vellore Institute of Technology

DEPARTMENT OF MATHEMATICS
SCHOOL OF ADVANCED SCIENCES

Winter Semester - 2022 ~ 2023

Continuous Assessment Test - I, January 2023

Course Code : BMAT202L

Course Name : Probability and Statistics

Duration : 90 Minutes

Slot: B1+TB1

Max. Marks: 50

Answer All Questions:

Q.No	Questions	Max. Marks	CO	BL																						
✓	<p>Calculate the Mean, Median and Mode for the following data:</p> <table border="1"> <tr> <td>Class</td> <td>130-134</td> <td>135-139</td> <td>140-144</td> <td>145-149</td> <td>150-154</td> <td>155-159</td> <td>160-164</td> </tr> <tr> <td>Frequency</td> <td>5</td> <td>15</td> <td>28</td> <td>24</td> <td>17</td> <td>10</td> <td>1</td> </tr> </table>	Class	130-134	135-139	140-144	145-149	150-154	155-159	160-164	Frequency	5	15	28	24	17	10	1	10	CO1	L3						
Class	130-134	135-139	140-144	145-149	150-154	155-159	160-164																			
Frequency	5	15	28	24	17	10	1																			
✓	<p>Calculate the quartile deviation for the following frequency distribution of the number of marks obtained by 49 students in a class.</p> <table border="1"> <tr> <th>Marks group</th> <th>No. of students</th> </tr> <tr><td>5-10</td><td>5</td></tr> <tr><td>10-15</td><td>6</td></tr> <tr><td>15-20</td><td>15</td></tr> <tr><td>20-25</td><td>10</td></tr> <tr><td>25-30</td><td>5</td></tr> <tr><td>30-35</td><td>4</td></tr> <tr><td>35-40</td><td>2</td></tr> <tr><td>40-45</td><td>2</td></tr> </table>	Marks group	No. of students	5-10	5	10-15	6	15-20	15	20-25	10	25-30	5	30-35	4	35-40	2	40-45	2	10	CO1	L3				
Marks group	No. of students																									
5-10	5																									
10-15	6																									
15-20	15																									
20-25	10																									
25-30	5																									
30-35	4																									
35-40	2																									
40-45	2																									
✓	<p>From the following data:</p> <table border="1"> <tr> <td>x</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>p(x)</td> <td>0.05</td> <td>0.1</td> <td>0.3</td> <td>0</td> <td>0.3</td> <td>0.15</td> <td>0.1</td> </tr> </table> <p>Find (i) $E(X)$, (ii) $E(2X \pm 3)$, (iii) $E((X - \bar{X})^2)$ and (iv) $Var(2X \pm 3)$.</p>	x	-3	-2	-1	0	1	2	3	p(x)	0.05	0.1	0.3	0	0.3	0.15	0.1	10	CO2	L4						
x	-3	-2	-1	0	1	2	3																			
p(x)	0.05	0.1	0.3	0	0.3	0.15	0.1																			
✓	<p>Suppose that two dimensional continuous random variable (X, Y) has joint probability density function given by:</p> $f(x, y) = \begin{cases} 6x^2y, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{elsewhere} \end{cases}$ <p>✓ Verify that $\int_0^1 \int_0^1 f(x, y) dx dy = 1$, ✓ (ii) Find $P(0 < X < \frac{3}{4}, \frac{1}{3} < Y < 2)$</p> <p>(iii) Find $P(X > Y)$ and (iv) Find $P(X < 1/ Y < 2)$</p>	10	CO2	L4																						
✓ 5	<p>The marks obtained by 10 students in two subjects are given below:</p> <table border="1"> <tr> <td>Subject 1</td> <td>48</td> <td>75</td> <td>30</td> <td>60</td> <td>80</td> <td>53</td> <td>35</td> <td>15</td> <td>40</td> <td>38</td> </tr> <tr> <td>Subject 2</td> <td>44</td> <td>85</td> <td>45</td> <td>54</td> <td>91</td> <td>58</td> <td>63</td> <td>35</td> <td>43</td> <td>45</td> </tr> </table> <p>Find the correlation coefficient.</p>	Subject 1	48	75	30	60	80	53	35	15	40	38	Subject 2	44	85	45	54	91	58	63	35	43	45	10	CO3	L2
Subject 1	48	75	30	60	80	53	35	15	40	38																
Subject 2	44	85	45	54	91	58	63	35	43	45																



DEPARTMENT OF MATHEMATICS

SCHOOL OF ADVANCED SCIENCES

WINTER SEMESTER 2022-2023

CONTINUOUS ASSESSMENT TEST - I

Programme Name : B.Tech
Course Code : BMAT202L
Course Name : Probability and Statistics
Slot : D1+TD1
Duration : 90 minutes

Max. Marks:50

Answer all the questions

Answer all the questions

S.No	Questions	Marks																						
1	<p>The following table gives the daily wages in rupees in a commercial organization</p> <table border="1"><thead><tr><th>Daily wages</th><th>10-20</th><th>20-30</th><th>30-40</th><th>40-50</th><th>50-60</th><th>60-70</th><th>70-80</th></tr></thead><tbody><tr><td>No. of persons</td><td>12</td><td>19</td><td>5</td><td>10</td><td>9</td><td>6</td><td>6</td></tr></tbody></table> <p>Find the mean value using deviation method and third Quartile for the above data.</p>	Daily wages	10-20	20-30	30-40	40-50	50-60	60-70	70-80	No. of persons	12	19	5	10	9	6	6	10M						
Daily wages	10-20	20-30	30-40	40-50	50-60	60-70	70-80																	
No. of persons	12	19	5	10	9	6	6																	
2	<p>The score of two players A and B in ten innings during a certain season are:</p> <table border="1"><tbody><tr><td>A</td><td>32</td><td>28</td><td>47</td><td>63</td><td>71</td><td>39</td><td>10</td><td>60</td><td>96</td><td>14</td></tr><tr><td>B</td><td>19</td><td>31</td><td>48</td><td>53</td><td>67</td><td>90</td><td>10</td><td>62</td><td>40</td><td>80</td></tr></tbody></table> <p>Find which of the two players A, B is more consistent in scoring.</p>	A	32	28	47	63	71	39	10	60	96	14	B	19	31	48	53	67	90	10	62	40	80	10M
A	32	28	47	63	71	39	10	60	96	14														
B	19	31	48	53	67	90	10	62	40	80														
3	<p>(a) A dice is tossed twice. A success is getting an odd number on a toss. Find the variance of the probability distribution of the number of successes.</p> <p>b) The diameter of an electric cable X is assumed to be continuous random variable with p.d.f $f(x) = 6x(1 - x), 0 \leq x \leq 1$. Determine $b \in \mathbb{R}$, such that $P(X < b)$ is same as $P(X > b)$.</p>	7M 3M																						
4	<p>Given a Joint density function $f(x, y) = \begin{cases} \frac{6-x-y}{8} & 0 < x < 2, 2 < y < 4, \\ 0 & \text{elsewhere} \end{cases}$</p> <p>Find</p> <ol style="list-style-type: none">Marginal density of X and Y.$P(2 < Y < 3 X < 2)$.$P(0 \leq X \leq \frac{1}{2} \text{ and } 2 \leq Y \leq 3)$.	10M																						
5	<p>Find Karl Pearson's coefficient of correlation from the following data between height of father (X) and son (Y).</p> <table border="1"><tbody><tr><td>X</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td></tr><tr><td>Y</td><td>66</td><td>67</td><td>65</td><td>68</td><td>70</td><td>68</td><td>72</td></tr></tbody></table> <p>Comment on the result.</p>	X	64	65	66	67	68	69	70	Y	66	67	65	68	70	68	72	10M						
X	64	65	66	67	68	69	70																	
Y	66	67	65	68	70	68	72																	

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Vellore Institute of Technology

**DEPARTMENT OF MATHEMATICS
SCHOOL OF ADVANCED SCIENCES
WINTER SEMESTER 2022-23
CONTINUOUS ASSESSMENT TEST - I**

Programme Name : B. Tech.
Course Code : BMAT202L
Course Name : Probability and Statistics
Slot : D2+TD2
Exam Duration : 90 minutes
Maximum Marks : 50

Answer All the Questions ($5 \times 10 = 50$)

S. No.	Questions	Marks																						
1.	<p>Compute the measures of central tendency of the following data:</p> <table><tr><th>Marks obtained</th><th>No of Candidates</th></tr><tr><td>0-10</td><td>22</td></tr><tr><td>10-20</td><td>35</td></tr><tr><td>20-30</td><td>8</td></tr><tr><td>30-40</td><td>0</td></tr><tr><td>40-50</td><td>38</td></tr><tr><td>50-60</td><td>15</td></tr><tr><td>60-70</td><td>5</td></tr><tr><td>70-80</td><td>5</td></tr><tr><td>80-90</td><td>10</td></tr><tr><td>90-100</td><td>2</td></tr></table>	Marks obtained	No of Candidates	0-10	22	10-20	35	20-30	8	30-40	0	40-50	38	50-60	15	60-70	5	70-80	5	80-90	10	90-100	2	10M
Marks obtained	No of Candidates																							
0-10	22																							
10-20	35																							
20-30	8																							
30-40	0																							
40-50	38																							
50-60	15																							
60-70	5																							
70-80	5																							
80-90	10																							
90-100	2																							
2.	<p>The following are the football rushing yards of two high school football teams A and B in a series of games:</p> <table><tr><td>Team A</td><td>12</td><td>15</td><td>6</td><td>13</td><td>7</td><td>19</td></tr><tr><td>Team B</td><td>27</td><td>12</td><td>16</td><td>12</td><td>4</td><td>21</td></tr></table> <p>Which team has the better running game and which is more consistent?</p>	Team A	12	15	6	13	7	19	Team B	27	12	16	12	4	21	10M								
Team A	12	15	6	13	7	19																		
Team B	27	12	16	12	4	21																		

The shelf life (in hours) of a certain perishable packaged food is a random variable whose probability density function is given by

$$f(x) = \begin{cases} \frac{20000}{(x+100)^3}, & \text{if } x > 0 \\ 0, & \text{otherwise} \end{cases}$$

3.

10

Find the probability that one of the packages will have a shelf life of (a) atleast 200 hours; (b) almost 200 hours.

The joint probability function of two discrete random variables X and Y is given as

X \ Y	0	1	2
	0	1	2
0	0	K	2k
1	2k	3k	4k
2	4k	5k	6k

4.

10

(a) Find the value of k .

(b) Find $P(Y < 2)$.

(c) Find $P(X \geq 1)$.

(d) Find $P(X \geq 1 | Y < 2)$.

(e) Find the marginal probability distribution of X .

Find the Karl Pearson's correlation coefficient for the following table:

5.

10

X	10	14	18	22	26
Y	18	12	24	6	30



SCHOOL OF ADVANCED SCIENCES
DEPARTMENT OF MATHEMATICS

SLOT F1

CONTINUOUS ASSESMENT TEST-I (January 2023)
WINTER SEMESTER 2022-23

Programme Name & Branch: B.Tech

Course Code: BMAT202L

Course Name: Probability and Statistics

Exam Duration: 90 minutes

Maximum Marks: 50

General instruction(s): Answer all questions $5 \times 10 = 50$

Sl.No.	Question	Marks																						
1.	<p>Calculate the lower quartile, median and upper quartile for the following distribution.</p> <table><tr><td>Age</td><td>54-57</td><td>58-61</td><td>62-65</td><td>66-69</td><td>70-73</td><td>74-77</td><td>78-81</td><td>82-85</td></tr><tr><td>No. of employees</td><td>5</td><td>7</td><td>10</td><td>12</td><td>6</td><td>5</td><td>4</td><td>1</td></tr></table>	Age	54-57	58-61	62-65	66-69	70-73	74-77	78-81	82-85	No. of employees	5	7	10	12	6	5	4	1	10				
Age	54-57	58-61	62-65	66-69	70-73	74-77	78-81	82-85																
No. of employees	5	7	10	12	6	5	4	1																
2.	<p>Find the coefficient of mean deviation from mean, coefficient of variation for the following data.</p> <table><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</td><td>4</td><td>36</td><td>100</td><td>232</td><td>280</td><td>204</td><td>112</td><td>28</td><td>4</td></tr></table>	x	0	1	2	3	4	5	6	7	8	f	4	36	100	232	280	204	112	28	4	10		
x	0	1	2	3	4	5	6	7	8															
f	4	36	100	232	280	204	112	28	4															
3.	<p>Let X and Y are 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 and 2. (i) Find all marginal distributions and means of X and Y. (ii) Determine the value of $P[X \leq 1/Y = 1]$.</p>	10																						
4.	<p>Let X and Y have the joint probability density function</p> $f(x,y) = \begin{cases} x^2 + \frac{xy}{3}, & 0 \leq x \leq 1, 0 \leq y \leq 2 \\ 0, & \text{otherwise} \end{cases}$ <p>Then Find (i) $P\left(X > \frac{1}{2}\right)$ (ii) $P(Y < X)$ (iii) $P\left(Y < \frac{1}{2}/X < \frac{1}{2}\right)$ (iv) Verify whether X and Y are independent?</p>	10																						
5.	<p>Obtain the correlation coefficient for the following ages of husbands(X) and wives (Y).</p> <table><tr><td>X</td><td>23</td><td>27</td><td>28</td><td>28</td><td>29</td><td>30</td><td>31</td><td>33</td><td>35</td><td>36</td></tr><tr><td>Y</td><td>18</td><td>20</td><td>22</td><td>27</td><td>21</td><td>29</td><td>27</td><td>29</td><td>28</td><td>29</td></tr></table>	X	23	27	28	28	29	30	31	33	35	36	Y	18	20	22	27	21	29	27	29	28	29	10
X	23	27	28	28	29	30	31	33	35	36														
Y	18	20	22	27	21	29	27	29	28	29														