VIT
Vellore Institute of Technology
CHENNAI

Reg. Number:	

Continuous Assessment Test (CAT) – I AUGUST 2025

Programme	:	B. Tech	Semester	:	FALL 2025-2026
Course Code & Course Title	:	BMAT202L Probability & Statistics	Class Number	:	CH2025260101139/ 1141/ 1143/ 1147/ 1150 /1153/ 1336/ 1351/1371
Faculty	:	Dr Krishna Kumar, Dr Revathi GK, Dr Parthiban V, Dr Amit Kumar Rahul, Dr Avinash Kumar Mittal, Dr Devi Yamini S, Dr G Y Mythili, Prof Anitha G, Dr Hannah Grace G	Slot	:	E1+TE1
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

<table>
<tr><th>Q. No</th><th>Sub Sec.</th><th>Description</th><th>Marks</th><th>CO</th><th>BT Level</th></tr>
<tr><td rowspan="2">1</td><td>(a)</td><td>Find the missing frequencies in the following frequency distribution whose mean is 34.
<table>
<tr><td>x</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>Total</td></tr>
<tr><td>f</td><td>4</td><td>f1</td><td>8</td><td>f2</td><td>3</td><td>4</td><td>35</td></tr>
</table></td><td>7</td><td>1</td><td>3</td></tr>
<tr><td>(b)</td><td>The following data is obtained from the survey. Compute H.M
<table>
<tr><td>Speed of car</td><td>130</td><td>135</td><td>140</td><td>145</td><td>150</td></tr>
<tr><td>No of cars</td><td>3</td><td>4</td><td>8</td><td>9</td><td>2</td></tr>
</table></td><td>3</td><td>1</td><td>3</td></tr>
<tr><td>2</td><td></td><td>An agricultural scientist is studying the weights (in grams) of wheat grains collected from a field. The data is presented as a frequency distribution below.
<table>
<tr><th>Grain weight (grams)</th><th>Number of Samples</th></tr>
<tr><td>10-14</td><td>6</td></tr>
<tr><td>15-19</td><td>10</td></tr>
<tr><td>20-24</td><td>22</td></tr>
<tr><td>25-29</td><td>30</td></tr>
<tr><td>30-34</td><td>20</td></tr>
<tr><td>35-39</td><td>12</td></tr>
</table>
(i) Compute all the quartiles for the above data and interpret the results in the context of the wheat grain weight distribution. (8 marks)
(ii) Calculate the quartile deviation and the coefficient of quartile deviation. (2 marks)</td><td>10</td><td>1</td><td>3</td></tr>
<tr><td>3</td><td>(a)</td><td>A random variable X has the following probability distribution.
<table>
<tr><td>x</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>0.1</td><td>K</td><td>0.2</td><td>$2K$</td><td>0.3</td><td>$3K$</td></tr>
</table></td><td>5</td><td>2</td><td>2</td></tr>
</table>

		(i) Find the K (1 mark) (ii) $P(X<2)$ and $P(-2<X<2)$ (2 mark) (iii) Find the CDF of X (2 mark)			
	(b)	If a random variable has the moment generating function (MGF) $M(t) = 3 / (3 - t)$, Obtain the expected value E[X] and standard deviation of X.	5	2	2
4		Let us assume we have a corpus of 100 words (corpus is a collection of text). The following table shows the words and their corresponding probabilities in the corpus. Words: the, to, will, of, earth, on, probe, some, come, BBC Probability: 0.30, 0.18, 0.16, 0.10, 0.07, 0.06, 0.04, 0.03, 0.03, 0.03 Let X denote the length of the word, and Y denote the number of vowels in that word. (i) Write the joint probability density table of X and Y. (2 marks) (Hint: X takes values 2, 3, 4, 5, and Y takes values 0, 1, 2.) (ii) Find the probability of occurrence of a 2-letter word with 1 vowel in it. (2 marks) (iii) Find the marginal probability distribution of the length of the word X. That is, for each possible word length (2, 3, 4, 5), compute the probability that a randomly selected word has that length. (2 marks) (iv) Compute the conditional probability that a randomly chosen word has exactly 2 vowels given that its length is 4. (2 marks) (v) Determine the expected length of a randomly selected word from the corpus. (2 marks)	10	2	3
5	(a)	The following table shows the performance of 12 salespersons in terms of units sold (X) and customer satisfaction scores(Y). X: 120, 110, 105, 130, 110, 95, 125, 108, 100, 118, 115, 95 Y: 88, 85, 80, 90, 87, 74, 89, 82, 76, 85, 86, 78 Compute the Spearman's rank correlation coefficient.	5	3	3
	(b)	A dataset of $N = 40$ observations have the following incorrect summary statistics. $\Sigma X = 220$, $\Sigma Y = 200$, $\Sigma X^2 = 1320$, $\Sigma Y^2 = 1020$, $\Sigma XY = 1080$. However, it was later found that the two observations (12,14) and (10,9) were entered incorrectly. The correct observations are (11,13) and(9,11). Find the correlated value of the Pearson correlation coefficient between X and Y.	5	3	2

**********All the best **********