



Continuous Assessment Test (CAT) – II - OCTOBER 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
- Statistical table is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level												
1	(a)	Find the regression equation of X_1 on X_2 and X_3 given the following results: <table><tr><th>Variables</th><th>Mean</th><th>S.D.</th></tr><tr><td>X_1</td><td>35.8</td><td>4.2</td></tr><tr><td>X_2</td><td>52.4</td><td>5.3</td></tr><tr><td>X_3</td><td>48.8</td><td>6.1</td></tr></table> $r_{12} = 0.6, r_{23} = 0.7$ and $r_{31} = 0.8$.	Variables	Mean	S.D.	X_1	35.8	4.2	X_2	52.4	5.3	X_3	48.8	6.1	5	3	3
	Variables	Mean	S.D.														
X_1	35.8	4.2															
X_2	52.4	5.3															
X_3	48.8	6.1															
(b)	(i) If $r_{12} = 0.8, r_{13} = -0.4$ and $r_{23} = -0.56$. Find all the partial correlation coefficient. (5 marks) (ii) Given that $x = 4y + 5$ and $y = kx + 4$ are the regression lines of X on Y and of Y on X are given respectively. Show that $0 \leq k \leq \frac{1}{4}$. If $k = \frac{1}{16}$, determine the means of X and Y and, as well as correlation coefficient r_{XY}. (5 marks)	10	3	3													
2	(a)	The lifetime X (in hundreds of hours) of a certain type of vacuum tube has a Weibull distribution with parameters $\alpha = 2, \beta = 3$. Compute the following: (i) $E(X)$ and $\text{Var}(X)$ (3 marks) (ii) $P(X \leq 5)$ (2 marks) (iii) $P(1.8 \leq X \leq 5)$ (2 marks)	7	2	3												

	(b)	There are 10 red and 20 blue balls in a box. A ball is chosen at random and it is noted whether it is red. The process repeats, returning the ball 10 times. Calculate the expected value and the standard deviation of this game.	3	2	3											
3	(a)	Engineers designing the next generation of space shuttles plan to include two fuel pumps—one active, the other in reserve. If the primary pump malfunctions, the second is automatically brought on line. Suppose a typical mission is expected to require that fuel be pumped for at most 50 hours. According to the manufacturer's specifications, pumps are expected to fail once every 100 hours. What are the chances that such a fuel pump system would not remain functioning for the full 50 hours?	5	2	3											
	(b)	(i) The length of human pregnancies from conception to birth approximates a normal distribution with a mean of 266 days and a standard deviation of 16 days. What proportion of all pregnancies will last between 240 and 270 days (roughly between 8 and 9 months)? (3 marks) (ii) What length of time marks the shortest 70% of all pregnancies? (2 marks)	5	2	3											
4		A quality-control engineer suspects that the proportion of defective units among certain manufactured items has increased from the set limit of 0.01. To test this claim, he randomly selects 100 of these items and found that the proportion of defective units in the sample was 0.02. Test the engineer's hypothesis at the 0.05 level of significance.	5	4	4											
5	(a)	The guaranteed average life of a certain type of electric light bulbs is 1000 hrs with a standard deviation of 125 hours. It is decided to sample the output so as to ensure that 90 percent of the bulbs do not fall short of the guaranteed average by more than 2.5 per cent. What must be the minimum size of the sample?	5	4	4											
	(b)	The average number of defective articles per day in a certain factory is claimed to be less than the average of all the factories. The average of all the factories is 30.5. A random sample of 100 days showed the following distribution. <table border="1"> <tr> <td>CI</td><td>16-20</td><td>21-25</td><td>26-30</td><td>31-35</td><td>36-40</td></tr> <tr> <td>No. of days</td><td>12</td><td>22</td><td>20</td><td>30</td><td>16</td></tr> </table> Is the average less than the figure for all the factories?	CI	16-20	21-25	26-30	31-35	36-40	No. of days	12	22	20	30	16	5	4
CI	16-20	21-25	26-30	31-35	36-40											
No. of days	12	22	20	30	16											

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