Reg. No.:

Name :

VIT

Vellore Institute of Technology

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

Continuous Assessment Test (CAT)-II – Oct 2022

Programme	:	B.Tech	Semester	:	Fall Semester 2022
Course Code	:	BMAT202L/IMAT202L	Class Nbr(s)	:	CH2022231001609, CH2022231001613, CH2022231002106,CH2022231001614, CH2022231001616, CH2022231001617,CH2022231001620,CH2022231001624, CH2022231001626, CH2022231001627,CH2022231001846
Course Title	:	Probability and Statistics			
Faculty(s)	:	Dr. Kalyani Desikan, Dr. G.K.Revathi, Dr.B.Jagannathan, Dr.S.Dhanasekar, Dr.Poulomi De, Dr.R.Jayagopal, Dr.Sudip Debnath, Dr.S.Balaji, Dr.Thasari Dilleswar, Dr.Sethukumarasamy	Slot	:	F1+TF1
Time	:	90 Minutes	Max. Marks	:	50

Answer all the Questions

(5 X 10 = 50 Marks)

Q. No.	Sub-division	Question Text	Marks
1.		The Cumulative Distribution Function (CDF) of a random variable X is given by $F(x) = \begin{cases} 0, & x < 0 \\ x^2, & 0 \le x < 1 \\ 1, & x \ge 1 \end{cases}$ i) Find the probability density function of X. ii)) Find $P(0.5 < X \le 0.75)$. iii) Find $P(X > 0.75 \mid X \ge 0.5)$.	10
2.		The joint probability density function of the two dimensional random variables (X, Y) is given by: $f(x,y) = \begin{cases} \frac{x^3y^3}{k}, & 0 \le x \le 2, \quad 0 \le y \le 2 \\ 0 & \text{elsewhere} \end{cases}$	10

		(i) Find k. (ii) Variance $var(2X)$. (iii) Examine whether X and Y are dependent or not.	
3.		a) Suppose X is a discrete random variable and has the moment generating function $M_X(t) = \frac{1}{7}e^{2t} + \frac{3}{7}e^{3t} + \frac{2}{7}e^{5t} + \frac{1}{7}e^{8t}$. What is the probability mass function of X? Find E(X) and Var(X) using MGF. Also, find $P(\|X\| > 3)$. b) The previous records show that the probability of VIT students getting their dream offer is 0.32. Find the probability for a student to get the dream offer from at least 2 companies if they attend 6 interviews. Also, find the probability of getting dream offer from at most 3 companies if they attend 8 interviews.	5+5
4.		a) In a class, the number of students who complete CAT-2 within 30 minutes follows Poisson distribution with an average of 2. Determine the probability that at least three students in a class will complete the exam within 30 minutes. Also, determine the probability that not more than two students in a class will complete the exam in 30 minutes. b) The number of tickets sold for the film Ponniyin Selvan - 1 in the IMAX theatre on a particular day follows an exponential distribution with an average of 250 tickets. What is the probability that the number of tickets sold is more than 300? What is the probability that the number of tickets sold is more than 350, if already 300 tickets are sold?	5+5
5.		The distribution of marks (out of 50) in BMAT202L during CAT - 1 follows a normal distribution with mean 21 and standard deviation 5. The school intends to provide advanced training to the top 20% of the students. Find the lowest mark for attending the advanced training. For those who score below 15, additional classes are also arranged. Calculate the percentage of students who will attend the additional classes.	10