


		Reg. No.:	
		Name :	
<div style="text-align: center;">  <div style="display: inline-block; vertical-align: middle;"> <h1 style="margin: 0;">VIT<sup>®</sup></h1> <p style="margin: 0;"><b>Vellore Institute of Technology</b> (Deemed to be University under section 3 of UGC Act, 1956)</p> </div> </div>			
<b>Continuous Assessment Test I – January 2023</b>			
Programme	: <b>B.Tech (ECE)</b>	Semester	: <b>WS 2022-23</b>
Course	: <b>Random Processes</b>	Code	: <b>BECE207L</b>
		Class Nbr	: <b>CH2022235000478 CH2022235000481 CH2022235000483 CH2022235000476</b>
Faculty	: <b>Dr Chandrasekaran N, Dr. Jeetashree Aparajeeta, Dr. Kalaivanan K., Ralph Thangaraj</b>	Slot	: <b>B2+TB2</b>
Time	: <b>90 Minutes</b>	Max. Marks	: <b>50</b>
<b>Answer <u>ALL</u> the questions</b>			
Q.No.	Sub. Sec.	Questions	Marks
1.		<p>The joint PMF of two random variables X and Y is given by</p> $f_{XY}(x, y) = \begin{cases} k(5x + 3y); & x=1,2; \quad y=1,2 \\ 0 & \text{otherwise} \end{cases}$ <p>Where <math>k</math> is a constant.</p> <p>(i) Find the value of <math>k</math></p> <p>(ii) Find marginal probability mass function of X and Y</p> <p>(iii) Are X and Y independent?</p> <p>(iv) What is the conditional PMF of Y given by X?</p> <p>(v) What is the conditional PMF of X given by Y?</p>	10
2.		<p>Two random variables X and Y have the joint PDF given by</p> $f_{XY}(x, y) = \begin{cases} \frac{1}{3}(x - y) & ; 0 \leq y < x < 2 \\ 0 & ; \text{otherwise} \end{cases}$ <p>Find (a) <math>P[X &gt; 1   Y = 1]</math></p> <p>(b) <math>P[Y &gt; 1   X = 1]</math></p>	10
3.		<p>Suppose we choose two numbers at random from the interval <math>[0, \infty]</math> with an exponential density with parameter <math>\lambda</math>. What is the probability density function of their sum?</p> $f_X(x) = f_Y(x) = \begin{cases} \lambda e^{-\lambda x}, & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$	10
4.		<p>Let X and Y be statistically independent random variables with <math>\bar{X}=1</math>, <math>\bar{Y}=2</math>, <math>\overline{X^2}=2</math>, <math>\overline{Y^2}=4</math>. For a random variable</p> $W = 2X - Y + 1$ <p>Find <math>R_{XY}</math>, <math>R_{XW}</math>, <math>R_{YW}</math>, <math>C_{XY}</math>. Are X and Y uncorrelated?</p>	10

5.	<p>Two random variables X and Y have the density function</p> $f_{X,Y}(x,y) = \begin{cases} \frac{2}{3}x^2e^{-xy}; & 2 > x > 1, \infty > y > 0 \\ 0 & \text{otherwise} \end{cases}$ <p>Find the following.</p> <ul style="list-style-type: none"> <li>(i) First order moments <math>m_{10}</math> and <math>m_{01}</math>.</li> <li>(ii) Second order moments <math>m_{20}, m_{02}</math> and <math>m_{11}</math>.</li> <li>(iii) The covariance <math>C_{XY}</math>.</li> <li>(iv) Are X and Y uncorrelated?</li> <li>(v) Are X and Y orthogonal?</li> </ul>	10
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