UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Name of the Course: **Random Variables & Stochastic Processes**
Class: **II B.Tech II-Sem**
Academic Year: **2019-20**

Tutorial # 3

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1. Define mn^{th} joint moment of the random variables X and Y.
2. Define marginal distribution and density functions.
3. Define correlation coefficient and show that $-1 \le \rho \le 1$.
4. Write the expression for joint PDF of jointly Gaussian random variables X and Y.
5. Two random variables X and Y have a JPDF given by

$$f_{XY}(x,y) = \begin{cases} Ae^{-(2x+3y)} & x \ge 0, y \ge 0 \\ 0 & x < 0, y < 0 \end{cases}$$

   Find
   a) the value of A for which this is a valid JPDF
   b) the probability that $X < 1/2$ and $Y < 1/4$
   c) the expected value of XY
6. Show that $Var[X \pm Y] = Var[X] + Var[Y] \pm 2Cov[X,Y]$. If X and Y are statistically independent, what will be the result?
7. Two random variables have means of 1 and variances of 1 and 4, respectively. Their correlation coefficient is 0.5.
   a) Find the variance of their sum
   b) Find the mean-square value of their sum
   c) Find the mean-square value of their difference
8. The random variables, X and Y, have a joint PDF given by
   $f_{XY}(x,y) = 4xy \quad 0 < x < 1, \quad 0 < y < 1$. By transformation of random variables find the probability density function of $Z = X + Y$.
9. Two random variables V and W are obtained by transforming the random variables X and Y as

$$V = Xcos\theta + Ysin\theta$$
$$W = Xsin\theta - Ycos\theta$$

   Find the $f_{VW}(v,w)$ in terms of $f_{XY}(x,y)$.