**KFUPM**-EE DEPT.

EE570- Stochastic Processes

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Assignment # 3 Due:

**Multiple Random Variables and Operations on Them**

Version 2.0 revised

1. The joint density functions of two random variables $X$ and $Y$ is

$$f\_{X,Y}\left(x,y\right)=0.1δ\left(x\right)δ\left(y\right)+0.12δ\left(x-4\right)δ\left(y\right)+0.05δ\left(x\right)δ\left(y-1\right)+0.25δ\left(x-2\right)δ\left(y-1\right)+0.3δ\left(x-2\right)δ\left(y-3\right)+0.18δ\left(x-4\right)δ\left(y-3\right)$$

Find and plot the marginal distribution of $X$ and *Y*.

1. Given the joint distribution function

$$F\_{X,Y}\left(x,y\right)=u\left(x\right)u\left(y\right)[1-e^{-ax}-e^{-ay}+e^{-a\left(x+y\right)}]$$

1. Find the conditional density functions $f\_{X}(x|Y=y)$ and $f\_{Y}(y|X=x)$.
2. Are the random variables $X$ and $Y$ statistically independent?
3. Find $P\{2<X\leq 4|0<Y<2\}$
4. Two random variables X and Y have means $\overbar{X}=1$ and $\overbar{Y}=2$, variances $σ\_{X}^{2}=4$ and $σ\_{Y}^{2}$=1, and the correlation coefficient $ρ\_{XY}=0.4 $.The new random variables W and V are defined by

$V=-X+2Y$ $W=X+4Y$

Find

1. The means
2. The variances
3. The correlation and
4. The correlation coefficient $ρ\_{VW}$of $V$ and $W$.
5. $X$ and $Y$ are uniformly distributed on the triangular region$ 0<x\leq y\leq x+y\leq 2$.
	1. Find the pdf of Z=X+Y.
	2. Verify your solution by finding the pdf for Z using Matlab simulation. i.e. generate the random variables X and Y and add them and then get their pdf. Plot the estimated surface pdf. Discuss the impact of number of points on the accuracy of your estimation. $N$=100, 1000, 10000.

In order to learn random variables and processes

"Take chances, make mistakes, get messy!" **in the HW assignment!**

Good luck , **Dr. Ali H. Muqaibel**