



COLLEGE OF ENGINEERING & TECHNOLOGY

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Course : Communication Systems II

Course Code : EC 421

Sheet (5)- Multiple Random Variables

- 1- Find the marginal pmf's for the pairs of random variables with the indicated joint pmf.

		X		
Y		-1	0	1
-1		1/6	0	1/6
0		0	1/3	0
1		1/6	0	1/6

Find the probability of the events $A = \{X \leq 0\}$, $B = \{X \leq Y\}$, and $C = \{X = -Y\}$ for the above joint pmf's

- 2- Let X and Y denote the amplitude of noise signals at two antennas. The random vector (X, Y) has the joint pdf

$$f(x, y) = ax e^{-ax^2/2} by e^{-by^2/2} \quad x > 0, y > 0, a > 0, b > 0$$

- Find the joint cdf
- Find $P[X > Y]$
- Find the marginal pdf's

- 3- The random variable (X, Y) has the joint pdf

$$f(x, y) = k(x+y) \quad 0 < x < 1, 0 < y < 1.$$

- Find k
- Find the joint cdf of (X, Y)
- Find the marginal pdf of X and Y

4- Let X and Y be independent random variables that are uniformly distributed in [0,1]. Find the probability of the following events:

a. $P[X^2 < 1/2, |Y-1| < 1/2]$

b. $P[X/2 < 1, Y > 0]$

c. $P[XY < 1/2]$

d. $P[\min(X,Y) > 1/3]$

5- Let X and Y be independent exponential random variable. Find the pdf of $Z = |X-Y|$

6- The random variables X and Y have the joint pdf

$$f_{XY}(x,y) = 2 e^{-(x+y)} \quad 0 \leq y \leq x < \infty$$

Find the pdf of $Z = X+Y$. Note: X and Y are not independent

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a. Find $E[(X+Y)^2]$

b. Find the variance of X+Y

c. Under what condition is the variance of the sum equal to the sum of the individual variances?