COLLEGE OF ENGINEERING & TECHNOLOGY

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Course : Communication Systems II

Course Code : EC 421

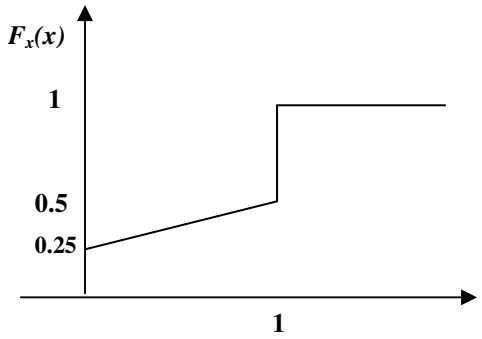
Sheet (3)- Random Variables-II

1- A random variable X has pdf

$$f_x(x) = \begin{cases} c\,x\,(1-x) & 0 \le x \le 1 \\ 0 & \text{elsewhere} \end{cases}$$

a. Find c
b. Find $P[1/2 \le X \le 3/4]$
c. Find $F_x(x)$

2- The cdf of the random variable X is shown in the figure below



Find the following probabilities in terms of the cdf of X:

$P[X< -1/2]$ $P[X<0]$ $P[1/4 \le X \le 1]$ $P[X> 1/2]$

3- Let Y= |X| be the output of a full wave rectifier with input voltage X.

a. Find the cdf of Y by finding the equivalent event of $\{Y \le y\}$. Find the pdf of Y by differentiation of the cdf.
b. Find the pdf of Y by finding the equivalent event of $\{ y < Y \le y + dy \}$. Does the answer agree with part a ?
c. What is the pdf of Y if $f_x(x)$ is an even function of x.

4- Let the random variable X have a laplacian pdf

$$f_x(x) = 1/2\ (\alpha\ e^{-\alpha|x|}) \qquad \alpha > 0 \qquad -\infty \leq x \leq \infty$$

Suppose that X is input into the eight-level uniform quantizer. Find the pmf of the quantizer output levels. Find the probability that the input X exceeds the range +/- 4d of the quantizer.

5- Let $Y = e^X$

a. Find the cdf and pdf of Y interms of the cdf and pdf of X

b. Find the pdf of Y when X is a Gaussian random variable. IN this case Y is said to have a lognormal pdf.