EEE/ECE F311
Communication Systems
Tutorial-9

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Q1. A continious random variable X has the probability density function (PDF)

$$f_X(x) = \begin{cases} 2x, & 0 \le x \le 1 \\ 0, & \text{otherwise} \end{cases}$$

(a) verify that $f_X(x)$ is a valid PDF.

(b) Find CDF, $F_X(x)$

(c) compute $p(0.25 \le x \le 0.75)$

(d) Find $p(x > 0.5)$

Q2. Find CDF for $f_x(x) = \begin{cases} \frac{1}{b-a}, & \text{for } a < x < b \\ 0, & \text{Elsewhere} \end{cases}$

Q3. Consider a WSS random process $X(t)$ with

$$R_X(\tau) = e^{-a|\tau|},$$

where a is a positive real number. Find the PSD of $X(t)$.

Q4.A random process $\{X(t)\}$ is applied to a network with response $h(t) = te^{-bt}u(t)$, where $b > 0$ is a constant. The cross function of $X(t)$ with the output $Y(t)$ is known to have the same $i.e$ ACF $\cdot R_{XY}(\tau) = \tau e^{-b\tau}u(\tau)$. Find the ACF of the output $\{Y(t)\}$. (ACF-Autocorrelation function)

Q5. Assume a random process $\{X(t)\}$ is given to a system with for system

transfer function $H(\omega) = \begin{cases} 1 & \text{for } |\omega| \leq \omega_0 \\ 0 & \text{else} \end{cases}$

If the ACF of input is $\frac{N_0}{2}\delta(\tau)$**, find the ACF of output.**