

# Assignment 9

## Probability and Random Variables

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### I. PROBLEM

Given :  $X(t)$  is a random process with a constant mean value of 2 and the auto correlation function

$$R_{xx}(\tau) = 4(e^{-0.2|\tau|} + 1)$$

Let  $X$  be the Gaussian random variable obtained by sampling the process at  $t = t_i$  and let

$$Q(\alpha) = \int_{\alpha}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{y^2}{2}} dy$$

The probability that  $[X \leq 1]$  is

### II. SOLUTION

Given auto correlation function is

$$R_{xx}(\tau) = 4(e^{-0.2|\tau|} + 1)$$

At  $X = 0$

$$R_{xx}(0) = 4(e^0 + 1) = 8 \quad (1)$$

$$\implies \sigma^2 = 8 \quad (2)$$

$$\implies \sigma = 2\sqrt{2}; \mu = 0 \quad (3)$$

Now  $P([X \leq 1]) = F_x(1)$

$$= 1 - Q\left(\frac{X - \mu}{\sigma}\right) \quad (4)$$

$$= 1 - Q\left(\frac{1 - 0}{2\sqrt{2}}\right) \quad (5)$$

$$= 1 - Q\left(\frac{1}{2\sqrt{2}}\right) \quad (6)$$

**Download latex code from here-**

[https://github.com/Swati-Mohanty/AI5002/blob/main/Assignment\\_9/codes/assignment9.tex](https://github.com/Swati-Mohanty/AI5002/blob/main/Assignment_9/codes/assignment9.tex)