Assignment 12

Jarpula Bhanu Prasad - AI21BTECH11015

June 14, 2022

Papoulis chap 10 Exercise 10.1

TABLE OF CONTENTS

Problem

Q)Find the first-order characteristics function

- a) of a Poission process and
- b) of a Wiener process

Solution

a)If $\tilde{x}(t)$ is a Poisson process , then for a fixed t , $\tilde{x}$(t) is a Poission random varaible with parameters λt. Hence from
If **x** is Poission distributed with parameter λ,

$$P\{\mathbf{x} = n\} = e^{-\lambda}\frac{\lambda^n}{n!} \qquad n = 0, 1, 2, 3, ... \tag{1}$$

$$Then \Gamma(z) = e^{-\lambda}\Sigma_{n=0}^{\infty}\lambda^n\frac{z^n}{n!} = e^{\lambda(z-1)} \tag{2}$$

Its chatracteristic function equals to

$$e^{\lambda t(e^{jw}-1)} \tag{3}$$

b) If $\tilde{x}(t)$ is a Wiener process then f(x,t) is N(0,$\sqrt{\alpha t}$),Hence
The chatacteristic function of an N(η,σ) random varaible x equals to

$$\Phi(\omega) = exp\{j\eta\omega - \frac{1}{2}\sigma^2\omega^2\} \tag{4}$$

its first order characteristics function is

$$e^{\frac{-\alpha t\omega^2}{2}} \tag{5}$$

CODES

Beamer

Download Beamer code from - Beamer