

# AI1110

## Assignment-5

Nishanth Bhoomi CS21BTECH11040

June 23, 2022

# Outline

1 Question

2 Solution

## Question

The process  $s(t)$  is shot noise with  $\lambda = 3$  where  $h(t) = 2$  for  $0 \leq t \leq 10$  and  $h(t) = 0$  otherwise. Find  $E\{s(t)\}$ ,  $E\{s^2(t)\}$ ,  $P\{s(7) = 0\}$

# Solution

Given  $\lambda = 3$ ,

$$h(t) = 2(0 \leq t \leq 10),$$

$$h(t) = 0 \text{ otherwise.}$$

$$\eta_s = E\{s(t)\} = \lambda \int_0^{10} h(t) dt = \lambda \int_0^{10} 2 dt = 3 \times 2(10 - 0) = 3 \times 20 = 60$$

$$\sigma_s^2 = \text{var}\{s(t)\} = \lambda \int_0^{10} h^2(t) dt = \lambda \int_0^{10} 4 dt = 3 \times 4(10 - 0) = 120$$

$$E\{s^2(t)\} - E\{s(t)\}^2 = \text{var}\{s(t)\}$$

$$E\{s^2(t)\} = E\{s(t)\}^2 + \text{var}\{s(t)\}$$

$$E\{s^2(t)\} = 3600 + 120$$

$$E\{s^2(t)\} = 3720$$

Finding  $P\{s(7)=0\}$ :

As  $s(7)=0$  if there are no points in the interval  $(7-10,7)$ . the number of points in this interval is a poisson RV with parameter  $10\lambda = 30$ .

Hence,

$$P\{s(7)=0\}=e^{-30}$$