AI1110
Assignment-6

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Outline

Question

Papoullis EX 10-7:

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 $\lambda = 3$,
$h(t) = 2$ $(0 \leq t \leq 10)$,
$h(t) = 0$ otherwise.

$$\eta_s = E\{s(t)\} = \lambda \int_0^{10} h(t)\,dt = \lambda \int_0^{10} 2\,dt = 3 \times 2(10 - 0) = 3 \times 20 = 60$$
$$\sigma_s^2 = var\{s(t)\} = \lambda \int_0^{10} h^2(t)\,dt = \lambda \int_0^{10} 4\,dt = 3 \times 4(10 - 0) = 120$$

$$E\{s^2(t)\} - E\{s(t)\}^2 = var\{s(t)\} \tag{1}$$
$$E\{s^2(t)\} = E\{s(t)\}^2 + var\{s(t)\} \tag{2}$$
$$= 3600 + 120 \tag{3}$$
$$E\{s^2(t)\} = 3720 \tag{4}$$

s(7)=0 if there are no points in the interval(7-10,7).the number of points in this interval is a poission RV with parameter $10\lambda = 30$.
Hence P{s(7)=0}=e^{-30}