Assignment 8: Papoullis Text Book

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Outline

1. Question
2. solution

Question

Example 12.7

Consider the process

$$y(t) = ax(t) \tag{1.0.1}$$

$$E\{a\} = 0 \tag{1.0.2}$$

where x(t) is a mean-ergodic process independent of the random variable a. Find whether y(t) is mean ergodic or not.

solution

Clearly $E\{y(t)\} = 0$

$$R_{yy}(\tau) = E\{a^2 x(t+\tau)x(t)\} = \sigma_a^2 R_{xx}(\tau) \tag{2.0.1}$$

(2.0.2)

The spectrum x(t) equals $S_{xx}^c(\omega) + 2\pi\eta_x^2\delta(\omega)$. Hence

$$S_{yy}(\omega) = \sigma_a^2 S_{xx}^c(\omega) + 2\pi\sigma_a^2\eta_x^2\delta(\omega) \tag{2.0.3}$$

This shows that the process y(t) is not mean-ergodic.