Assignment 13

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Papoulis chap 12 Example 12-8

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Problem

Q)Suppose that the process
$\mathbf{x}(t) = \mathbf{a}\cos(\omega t) + \mathbf{b}\sin(\omega t) + \eta$
is normal and stationary.

Solution

Clearly, $\mathbf{x}(t)$ is mean -ergodic because it does not contain a random constant. However it is not varaience-ergodic because the square

$$|\mathbf{x}(t)-\eta|^2 = \frac{1}{2}(\mathbf{a}^2+\mathbf{b}^2) + \frac{1}{2}(\mathbf{a}^2\cos(2\omega t) - \mathbf{b}^2\cos(2\omega t)) + \mathbf{ab}\sin(2\omega t) \tag{1}$$

of $\mathbf{x}(t)-\eta$ contains the random constant $\frac{\mathbf{a}^2+\mathbf{b}^2}{2}$

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