KFUPM

Electrical Engineering Department

EE-315 -121

Quiz#5

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1. White noise with power spectral density (PSD) $N\_{0}/2=6×10^{-6} W/Hz$ is applied to an ideal filter with gain $=2π $ and bandwidth $W$ (rad/s). Find $W$ so that the output's average noise power is 16 watts.

2.The auto-correlation function of a random process (r.p.) X(t) is

$$R\_{XX}\left(τ\right)=2+exp⁡(-τ^{2})$$

 (a) Find the power spectrum of X(t). (b) What is the average power?

3..Given the random process (r.p.)

$$X(t)=sin(w\_{0}t+θ)$$

$$Y\left(t\right)= sin^{2}(w\_{0}t+θ)$$

Where $w\_{0}$ is a constant and $θ$ is a random variable (r.v.) uniformly distributed on the interval $(-π,π)$. If the auto correlation of X(t) is $R\_{XX}\left(τ\right)=\frac{1}{2}cos⁡(w\_{0}τ)$ and the auto correlation of Y(t) is $R\_{YY}\left(τ\right)=\frac{1}{4}\left[1+\frac{1}{2}cos⁡(2w\_{0}τ)\right]$, are X(t) and Y(t) jointly wide sense stationary? (show your work)