









片語絮語
導師密碼卡線上化
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A Murmur of Light
導師密碼卡 - 一鍵搞定

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台灣聯合大學系統 113 學年度碩士班招生考試試題
類組: 電機類 科目: 通訊系統(通訊原理)(30分) 共 4 頁第 2 頁

3. (Total = 12%)
Assume $X(t)$ and $Y(t)$ are two wide-sense stationary random processes with the auto-correlation functions $R_X(\tau) = 10e^{-2|\tau|} + 2$ and $R_Y(\tau) = 3e^{-|\tau|} + 5$, respectively.

(a) (2%) Find the mean functions $E[X(t)]$ and $E[Y(t)]$.
(b) (2%) Find the variance functions $\text{Var}[X(t)]$ and $\text{Var}[Y(t)]$.
(c) (3%) Which random process has a wider bandwidth? Why?
(d) (3%) Which random process has a larger power? Why?
(e) (2%) Which random process is most like a Gaussian random process? Why?

4. (Total = 10%)
Consider a bandlimited communication system with the overall response of the transmitter, channel, and receiver filters being represented by the pulse shaping waveform $p(t)$. The Nyquist pulse shaping criterion

$$\sum_{k=-\infty}^{\infty} P\left(t + \frac{T}{2}\right) = T$$

provides a rule to design $p(t)$ to avoid inter-symbol interference (ISI) in the bandlimited system, where T is the sampling interval and $P(f)$ is the Fourier transform of the overall pulse $p(t)$.

(a) (6%) A commonly used pulse shaping waveform is the raised cosine pulse defined by

$$P(f) = \begin{cases} a, & |f| \leq W - \beta, \\ b + \frac{c}{2} \cos\left(\frac{\pi(W - |f|)\beta}{W - \beta}\right), & W - \beta \leq |f| \leq W + \beta, \\ 0, & |f| \geq W + \beta, \end{cases}$$

where $W = \frac{1}{2T}$ and β is the excessive bandwidth with $0 \leq \beta \leq W$. Find the constants a , b , c and d such that the above raised cosine spectrum satisfies the Nyquist pulse shaping criterion.

(b) (4%) Consider another pulse shaping spectrum $P(f)$ shown below, where the vertical axis of the plot corresponds to the value of $\frac{1}{T}P(f)$ and the labeled frequencies correspond to the corner points of the spectrum. Find one signaling interval T such that the bandlimited system with the pulse $p(t)$ results in zero ISI.

注意: 背面有試題



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