國立中央大學通訊工程學系１００學年度碩士在職專班入學筆試

【基本通訊概論】試卷

考試地點：通訊館一棟 E1-109 室　　考試時間：１００分鐘　　試題總分：１００分

1. For a linear time-invariant system with an impulse response $h(t)=\begin{cases}1, 0\le t\le 2\cdot T\\ 0, \text{ otherwise}\end{cases}$, (a) plot the system output waveform $y(t)$ when the input is given by $x(t)=\delta(t)-\delta(t-2\cdot T)+\delta(t-3\cdot T)$; (b) find the values of A and θ in the system output signal $y(t)=A\cdot\cos(2\pi f_0 t+\theta)$ when the input is given by $x(t)=\cos(2\pi f_0 t)$; (c) find the frequency response of the system. (15%)

(Hint: $y(t)=x(t)*h(t)$; * : convolution; $\delta(t)$: unit impulse function; $X(f)=\Im\{x(t)\}=\int_{-\infty}^{\infty}x(t)\cdot e^{-j2\pi f t}dt$: Fourier transform of $x(t)$)

2. For a message signal $m(t)$ with $M(f)=\Im\{m(t)\}=\begin{cases}1, & 0.1\cdot W<|f|<W\\ 0, & \text{otherwise}\end{cases}$ (W : bandwidth of the signal), (a) what is the type of modulation when the transmission signal is given by $x(t)=m(t)\cdot\cos(2\pi f_0 t)$; (b) plot the Fourier transform of $X(f)=\Im\{m(t)\cdot\cos(2\pi f_0 t)\}$; (c) find the signal $y(t)=\left(m(t)\cdot\cos^2(2\pi f_0 t)\right)*h_{LP}(t)$ in terms of $m(t)$ when $H_{LP}(f)=\Im\{h_{LP}(t)\}=\begin{cases}1, |f|\le W\\ 0, \text{ otherwise}\end{cases}$; (d) plot the Fourier transform of $X(f)=\Im\{m(t)\cdot\cos(2\pi f_0 t)-\hat{m}(t)\cdot\sin(2\pi f_0 t)\}$ when $\hat{M}(f)=\Im\{\hat{m}(t)\}=\begin{cases}-j\cdot M(f), & 0<f\\ j\cdot M(f), & f<0\end{cases}$; (e) plot the Fourier transform of $M_\delta(f)=\Im\left\{\sum_{n=-\infty}^{\infty}m(n\cdot T)\cdot\delta(t-n\cdot T)\right\}$ when $\frac{1}{T}=3\cdot W$. (25%)

(Hint: $f_0 >> W$; $\cos^2(\theta)=\frac{1+\cos(2\theta)}{2}$; $e^{j\theta}=\cos(\theta)+j\cdot\sin(\theta)$; $\sum_{n=-\infty}^{\infty}m(nT)\cdot\delta(t-nT)=m(t)\cdot\left(\sum_{n=-\infty}^{\infty}\delta(t-nT)\right)$; $\sum_{n=-\infty}^{\infty}\delta(t-nT)=\frac{1}{T}\sum_{k=-\infty}^{\infty}e^{j2\pi k\cdot\frac{1}{T}\cdot t}$).

背面尚有題目

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