國立臺北科技大學 102 學年度碩士班招生考試

系所組別：2140 電機工程系碩士班丁組

第一節　通訊原理　試題

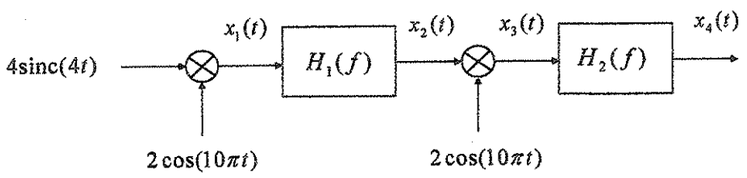
注意事項：

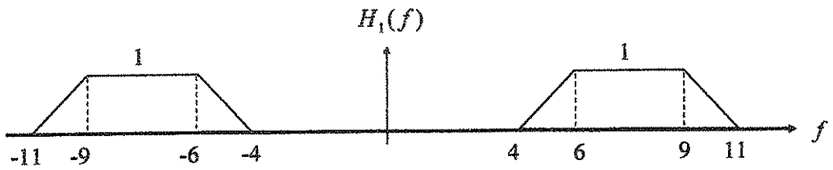
1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

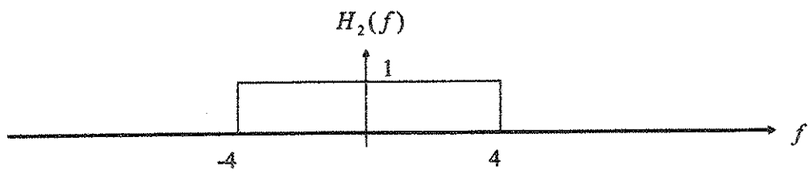
一、 (20 %)

Plot the spectra of $x_1(t)$, $x_2(t)$, $x_3(t)$, and $x_4(t)$ in the following system,

where $\text{sinc}(t)=\dfrac{\sin(\pi t)}{\pi t}$.







二、 (20 %)

Let $x(t)$ be a stationary Gaussian process with auto-correlation function $\text{sinc}^2(\tau)$.

If $x(t)$ is input to a linear time-invariant system with impulse response $\text{sinc}(2t)$.

Find the probability density function of output $y(t)$.

三、 (20 %)

Calculate $\int_{-12}^{12}(t^2+1)\left[\sum_{n=-\infty}^{\infty}\delta(t-5n)\right]dt$, where $\delta(t)$ is the unit impulse function.

四、 (20 %)

A coherent binary modulation basis function sends information bits via the following two waveforms with equal probability.

$$s_1(t)=\sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t),\ 0\le t\le T_b,\quad s_2(t)=\sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t+\frac{\pi}{4}),\ 0\le t\le T_b.$$

In the presence of additive white Gaussian noise of zero mean and single-sided power spectral density N_0, find the probability of bit error.

五、 (20 %)

Let C denote the (6,2) linear block code with generator matrix $\begin{pmatrix}0&0&0&1&1&1\\1&1&1&1&1&1\end{pmatrix}$.

List all the codewords and find the minimum Hamming distance of C.