

國立臺北科技大學 106 學年度碩士班招生考試

系所組別：2142 電機工程系碩士班丁組

第一節 訊號與系統 試題 (選考)

第一頁 共一頁

注意事項：

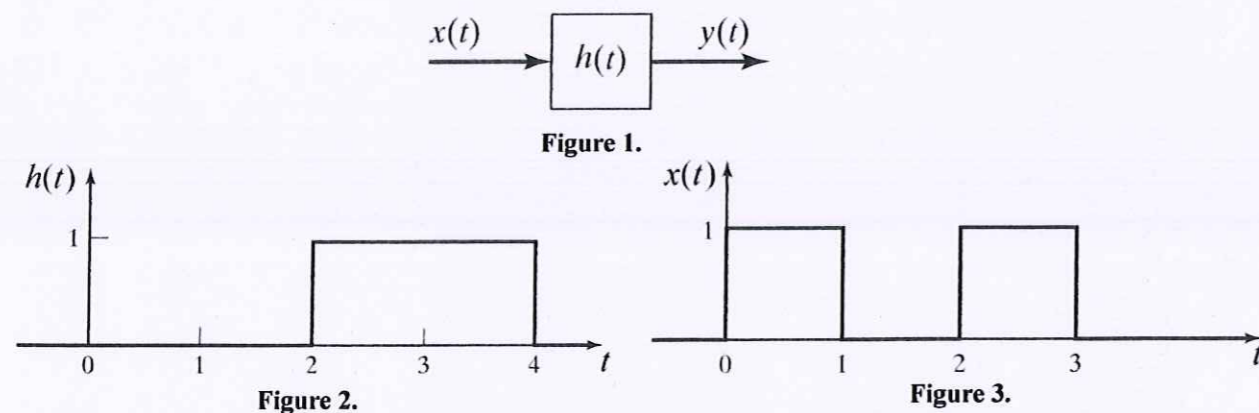
1. 本試題共【7】題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Evaluate the integral $\int_{-\infty}^{\infty} t \sin(t) \delta(2t - \pi) dt$, where $\delta(t)$ is the unit impulse function.

(15 %)

2. Consider the continuous-time linear time-invariant system of **Figure 1** with the impulse response $h(t)$ as shown in **Figure 2**. Use the **convolution integral** to determine the system response $y(t)$ for the input $x(t)$ of **Figure 3**. (15 %)

(本題若不用限定方法解題將不予計分)



3. The periodic signal $x(t) = 2 + 3 \cos(2\omega_0 t + \pi/3) + 5 \sin(3\omega_0 t + \pi/6)$ can be converted into a

Fourier series in complex exponential form $\sum_{k=-\infty}^{\infty} c_k e^{jk\omega_0 t}$. Determine the Fourier

coefficients c_k for all k . (15 %)

4. For the signal $x(t)$ of **Figure 4**, use the **definition of the Fourier transform**,

$$X(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt, \text{ to calculate its frequency spectrum } X(\omega) \text{ in the form of}$$

$|X(\omega)| e^{j\theta(\omega)}$. Plot the magnitude frequency spectrum $|X(\omega)|$ in the frequency domain.

(15 %)

(本題若不用限定方法解題將不予計分)

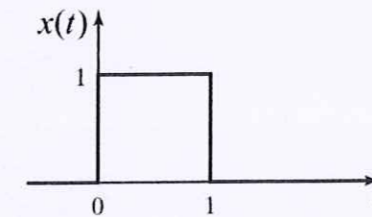


Figure 4.

5. For the signal $x[n]$ of **Figure 5**, plot $y[n] = 2 - x[2n]$. (15 %)

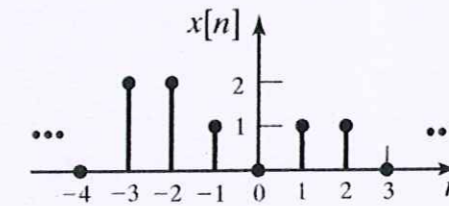


Figure 5.

6. Use the **method of undetermined coefficients** to find the output $y[n]$ of the discrete-time linear time-invariant system described by the following difference equation and initial values, $y[n] - 0.75y[n-1] + 0.125y[n-2] = 3u[n]$, $y[-2]=0$, $y[-1]=8$, where $u[n]$ is the unit step sequence. (15 %)

(本題若不用限定方法解題將不予計分)

7. The output $y[n]$ of a discrete-time linear time-invariant system is $(1 - 0.6^{n+1})u[n]$ when the input is $0.5^n u[n]$. Find the transfer function $H(z)$ of the system. (10 %)