

國立台灣科技大學一百學年度碩士班招生試題

系所組別：電機工程系碩士班丙組

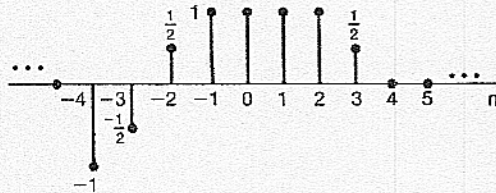
科目：信號與系統

(總分為100分)

總分 100 分，請依序作答

一、(20%) A discrete-time signal is shown as following. Sketch and label carefully each of the following signals. (4% each) :

(a) $x[n-4]$ (b) $x[3-n]$ (c) $x[3n]$ (d) $x[3n+1]$ (e) $\frac{1}{2}x[n] + \frac{1}{2}(-1)^n x[n]$



二、(20%)

(a) (10%) Please elaborate the Gibb's phenomenon.

(b) (10%) Please prove the Parseval's relation:

$$\int_{-\infty}^{+\infty} |x(t)|^2 dt = \frac{1}{2\pi} \int_{-\infty}^{+\infty} |X(j\omega)|^2 d\omega$$

三、(10%)

Use the convolution integral to determine the convolution of two exponential signals with the same exponent, namely, $y(t) = [e^{-at}u(t)] * [e^{-bt}u(t)]$, ($a \neq b$).

四、(20%) Suppose that the continuous-time LTI system is defined by the following I/O relation:

$$y[n] = x[n] + x[n-2]$$

(a) (5%) Find the impulse response of this system.

(b) (5%) Find the frequency response of this system.

(c) (5%) Plot the magnitude of the frequency response.

(d) (5%) Find $y[n]$ if $x[n] = 2e^{j\pi/4} e^{j(\pi/3)n}$

五、(20%)

Find the poles and zeros of $H(z) = 1 - 2z^{-1} + 2z^{-2} - z^{-3}$ and plot the poles and zeros in the Z-domain.

六、(10%)

Discrete-time signal $x_1[n]$ is sampled from $x_1(t) = \cos(400\pi t)$ and $x_2[n]$ is sampled from $x_2(t) = \cos(2400\pi t)$. The sampling frequency is 1000 Hz.

(a) (5%) Derive the digital frequency of $x_1[n]$ and $x_2[n]$.

(b) (5%) plot the digital spectrums of both signals.

