

## 國立台灣科技大學九十七學年度碩士班招生試題

系所組別：電機工程系碩士班丙組

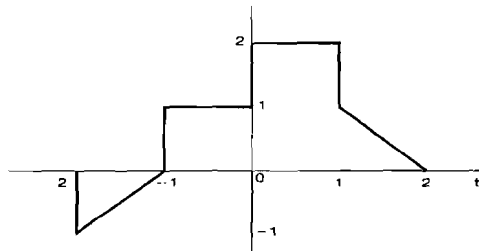
科目：信號與系統

總分 100 分

一、(12%) A continuous-time signal is shown as following. Sketch and label carefully each of the following signals:

(a)  $x(t-1)$  (b)  $x(2-t)$  (c)  $x(2t+1)$  (d)  $x(4-t/2)$  (e)  $[x(t)+x(-t)]u(t)$

(f)  $x(t)[\delta(t + \frac{3}{2}) - \delta(t - \frac{3}{2})]$



二、Consider the signals as following, calculate the Fourier transform.

(a) (8%)  $x(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & |t| > T_1 \end{cases}$

(b) (10%)  $x[n] = \begin{cases} 1, & |n| \leq N_1 \\ 0, & |n| > N_1 \end{cases}$

三、Determine the Fourier transform of each of the following periodic signals:

(a) (10%)  $x(t) = \sum_{k=-\infty}^{+\infty} \delta(t - kT)$

(b) (10%)  $\sin(2\pi t + \frac{\pi}{4})$

四、(20%) For  $x[n] = \begin{cases} 1, & n \leq -2 \\ n+3, & -1 \leq n \leq 3 \\ 6, & n \geq 3 \end{cases}$ , determine its Fourier transform  $X(e^{j\omega})$

using the accumulation and time shifting properties.

五、The system function of a LTI filter is given by

$$H(z) = z^{-1}(1 - z^{-1})(1 - jz^{-1})(1 + jz^{-1})$$

(a) (8%) Write the difference equation that gives the relation between the input  $x[n]$  and the output  $y[n]$ .

(b) (6%) Find the output when the input is

$$x[n] = \delta[n] - 2\delta[n-1] + 2\delta[n-3] + \delta[n-4].$$



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(c) (6%) If the input to the system is of the form  $x[n] = e^{j\hat{\omega}n}$ , for what values of  $\hat{\omega}$  will the output be zero for all  $n$ ?

六、(10%) For a pair of connected ideal A/D and D/A converters with equal sampling rate  $f_s$ , when the input is  $x(t) = 5 \cos(2\pi(50)t) + 2 \cos(2\pi(150)t + \frac{\pi}{3})$ , determine the output  $y(t)$  for the following  $f_s = 60\text{Hz}, 240\text{Hz}, 1000\text{Hz}$ .

