國立臺北科技大學

九十二學年度電機工程系碩士班入學考試

訊號與系統試題

填准考證號碼

注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. A causal linear time-invariant (LTI) system is described by the following difference equation

$$y[n] = y[n-1] + y[n-2] + x[n-1]$$

(a) (7%) Find the system function $H(z) = Y(z) / X(z)$ for this system. Plot the poles and zeros of $H(z)$ and indicate the region of convergence.

(b) (7%) Find the unit impulse response of the system.

(c) (6%) You should have found the system to be unstable. Find a stable (noncausal) unit impulse response that satisfies the difference equation.

2. Consider a continue-time signal x(t) with frequency spectrum shown in Fig.1, plot the frequency spectra of its sampled sequences if the sampling frequency ω_s is

(a) (5%) 20 rad / sec,

(b) (5%) 30 rad / sec,

(c) (5%) 40 rad / sec,

(d) (5%) explain frequency aliasing phenomenon.

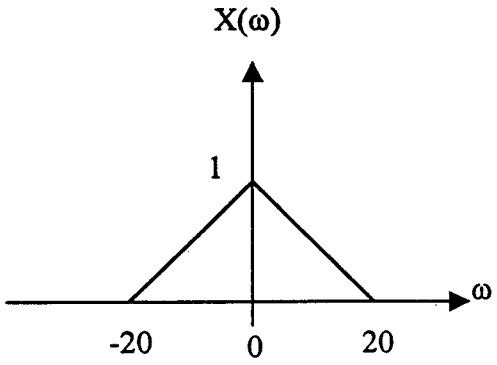

Fig. 1

3. Consider the finite sequence of length 3 ; that is , x[0] = 1 , x[1] = 0.5 , x[2] = -0.5 , and T = 0.5.

(a) (10%) Find its discrete-time Fourier transform (DTFT) and Nyquist frequency range.

(b) (10%) Find its discrete Fourier transform (DFT) and spectral locations (in rad/sec).

4. (20%) Find the percentage of the average power of

$$x(t) = 3 + 2\sin 2\pi t - \cos 2.1\pi t$$

at frequencies 0, 2π , and 2.1π rad / sec respectively.

5. (20%) Find the zero-state response of a system with transfer function $H(s) = 1 / [\, s(s+2) \,]$ excited by the application of the pulse input x(t) shown in Fig.2

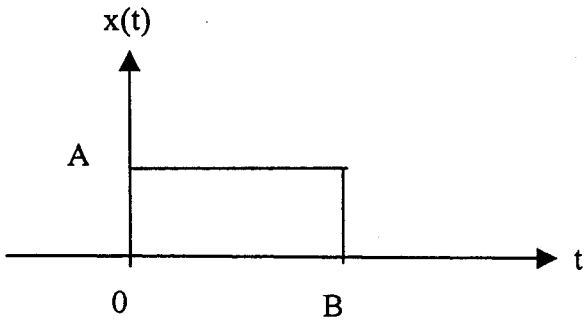

Fig.2

If A = 1 , what is B is order for the response to reach 5 as $t \to \infty$?

If B = 2 , what is A is order for the response to reach 5 as $t \to \infty$?