

# 國立臺北科技大學

## 九十三年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

第一頁 共一頁

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#### 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. Given an LTI system with the output given by

$$y(t) = \int_{-\infty}^t e^{-2(t-\tau)} x(\tau-1) d\tau$$

- (a) (10%) Find the impulse response of this system
- (b) (5%) Is this system causal? Prove your answer or no credit.
- (c) (5%) Is this system stable? Prove your answer or no credit.

2. In Figure 1, the magnitude of the weight of each impulse function is unity, with the signs of the weights alternating.

- (a) (10%) Find the exponential form of the Fourier series of the impulse train  $x(t)$  in Figure 1.

- (b) (10%) Find the Fourier Transform of the impulse train  $x(t)$  in Figure 1.

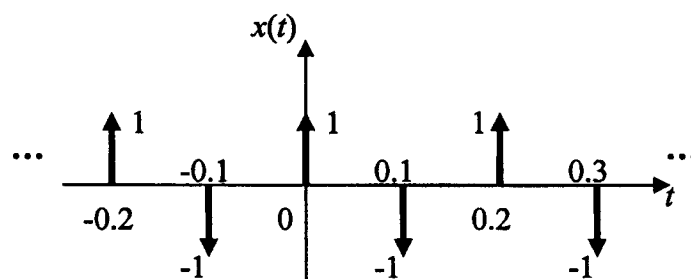


Figure 1

3. The analog signal  $f(t) = 7 \cos(100t) \cos(40t)$  is to be sampled using an ideal sampler.
- (a) (10%) What is the minimum sampling frequency  $\omega_{\min}$  rad/s to avoid aliasing.
- (b) (10%) Sketch the magnitude frequency spectrum of the resulting signal when a sampling frequency of  $\omega_s = 300$  rad/s is used.

4. (20%) A function  $y[n]$  has the unilateral z-transform

$$Y(z) = \frac{z^3}{z^3 - 3z^2 + 5z - 9}$$

Find the z-transform of  $y_1[n] = y[n+3]u[n]$

5. Consider the block diagram of a causal discrete-time system in Figure 2.

- (a) (10%) Determine the range of the parameter  $a$  for which this system is BIBO stable.
- (b) (10%) Let  $a=0.5$ . Find the unit step response of this system.

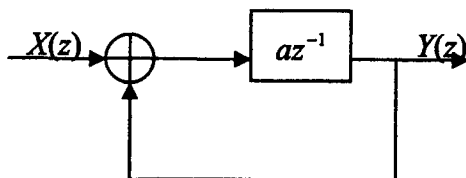


Figure 2