California State University, Sacramento
The College of Engineering and Computer Science

EEE 180 Signals & Systems

Final Exam

Spring 2023

Student Name: _____

1.[24 points] Select one correct answer for Each of the following questions. Each question below has only one correct answer.

(1). The signal y is defined by: $y = \int_0^{\infty} \delta(t)dt$, then which answer below is correct? _____

A. y=1 B. $y = \infty$ C. y = u(t)

(2). The discrete-time signal $y=2\cos(1.5\pi k + \frac{\pi}{4})$ is periodic. Which N value below can be used as the period of y? _____

A. N=1 B. N = 2 C. N = 4

(3). A bounded-input and bounded-output system is called a _____ system.

A. Causal B. Stable C. Linear

(4). The continuous-time signal $y=2\cos(3\pi t + \frac{\pi}{4})$. When the sampling frequency is 10 Hz, will the aliasing problem show up? _____

A. Yes B. No

(5). Two continuous time signals are: y1 = cos(t) and y2= cos(t) / t. Are they even or odd signals? _____

A. y1: even, y2: even
B. y1: even, y2: odd
C. y1: odd, y2: even
D. y1: odd, y2: odd

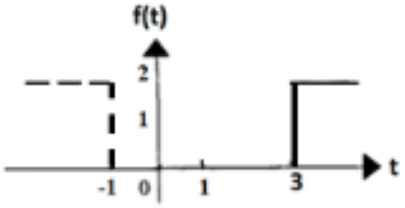
(6). The unilateral Laplace transform of δ(t) is _____

D. 1 B. 0 C. π/2 D. None of above

(7). The system is governed by the following equation:
dy(t) /dt + 3 y(t) + 2 = x(t) . Is this a linear system? _____

A. Yes B. No

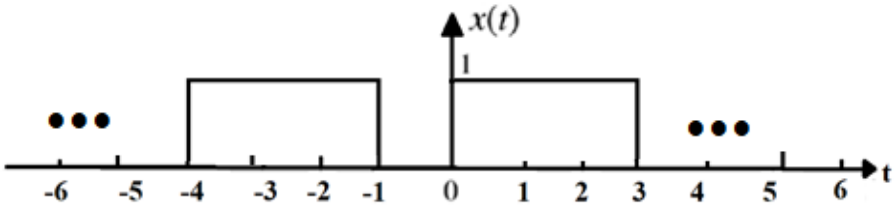
(8). The solid line below shows the waveform for f(t). What is the signal in the dashed line? _____



A. f(-t) B. f(-t + 2) C. f(-t – 2)

2.[36 points]

(1). Find the Exponential Fourier Series of the following periodic signal with a period of 4.



(2). Find the energy of the following signal:

$$x(t) = e^{-5t}u(t),$$

(3). Find the Fourier Transform of the following signal:

$$x(t) = e^{-5t}u(t)$$

(4). Find the z-transform of the sequence $x[n] = (0.2)^n u[n]$, and determine the region of convergence.

3. [40 points]

(1). Suppose the unilateral z-transform of f(t) is F(z), and the ROC is |z| > 8.

$$F(z) = \frac{6z}{(z-2)(z-8)}$$. Find the f(t) signal equation.

The unilateral z-transform pair table is given below.

Unilateral z-transform Pair Table

	$f[k]$	$F[z]$
1	$\delta[k-j]$	z^{-j}
2	$u[k]$	$\frac{z}{z-1}$
3	$ku[k]$	$\frac{z}{(z-1)^2}$
4	$k^2u[k]$	$\frac{z(z+1)}{(z-1)^3}$
5	$k^3u[k]$	$\frac{z(z^2+4z+1)}{(z-1)^4}$
6	$\gamma^{k-1}u[k-1]$	$\frac{1}{z-\gamma}$

(2). The discrete time input signal $x[k] = \delta[k] - 2\delta[k-2] + 2\,\delta[k-3]$

The discrete time signal system impulse response signal

$$h[k] = u[k] - u[k-2]$$

Draw the waveforms of x[k] and h[k].

(3). For the above question (3), the system output response signal is defined as the convolution result of $y[k] = x[k] * h[k]$.
Find the values of y[k].

(4). For an LTIC system described by the transfer function

$$H(s) = \frac{s + 0.5}{s + 1}$$

Find the steady-state system response y(t) to the input signal of $f(t) = 2\,u(t)$.