Started on	Friday, 17 November 2023, 5:40 PM
State	Finished
Completed on	Friday, 17 November 2023, 6:25 PM
Time taken	44 mins 48 secs
Grade	**13.00** out of 15.00 (**87**%)

Question 1

Correct

Mark 1.00 out of 1.00

The unilateral Laplace transform of a signal $x(t)$ is $X(s) = \dfrac{s+2}{s^2+4s+13}$. The energy of $x(t)$ is

Select one:

- $\frac{34}{52}$
- $\frac{17}{208}$
- $\frac{51}{104}$
- $\frac{17}{52}$
- $\frac{7}{52}$
- $\frac{17}{104}$ ✓
- None of the other options are correct
- $\frac{7}{104}$

Your answer is correct.

The correct answer is: $\frac{17}{104}$

Question 2

Incorrect

Mark 0.00 out of 1.00

An LTI system having transfer function $\frac{s^2+1}{s^2+2s+1}$ and input $x(t) = \sin(t+1)$ is in steady state. The output is sampled at a rate ω_s rad/s to obtain the final output $y(k)$. Which of the following is true?

Select one:

- $y(.)$ is zero for $-2 < \omega_s < 2$, but nonzero otherwise
- $y(.)$ is zero for $\omega_s > 2$, but nonzero for $\omega_s < 2$
- $y(.)$ is nonzero for all sampling frequencies ω_s ✗
- $y(.)$ is zero for $\omega_s < -2$, but nonzero for $\omega_s > -2$
- $y(.)$ is zero for all sampling frequencies ω_s
- $y(.)$ is nonzero for $\omega_s > 2$, but zero for $\omega_s < 2$
- $y(.)$ is zero for $\omega_s > -2$, but nonzero for $\omega_s < -2$
- none of the other options are correct

Your answer is incorrect.

The correct answer is: $y(.)$ is zero for all sampling frequencies ω_s

Question 3

Correct

Mark 1.00 out of 1.00

A continuous-time LTI system is described by $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = 2\frac{dx(t)}{dt} + 4x(t)$. Assuming zero initial conditions, the response $y(t)$ of the above system for the input $x(t) = e^{-2t}u(t)$ is given by

Select one:

- $(-e^{-t} - e^{-3t})u(t)$
- $(e^{-t} + e^{3t})u(t)$
- $(e^{t} + e^{-3t})u(t)$
- $(e^{-t} + e^{-3t})u(t)$
- $(e^{-t} - e^{-3t})u(t)$ ✓
- $(e^{t} + e^{3t})u(t)$
- $(e^{t} - e^{3t})u(t)$
- none of the other options are correct

Your answer is correct.

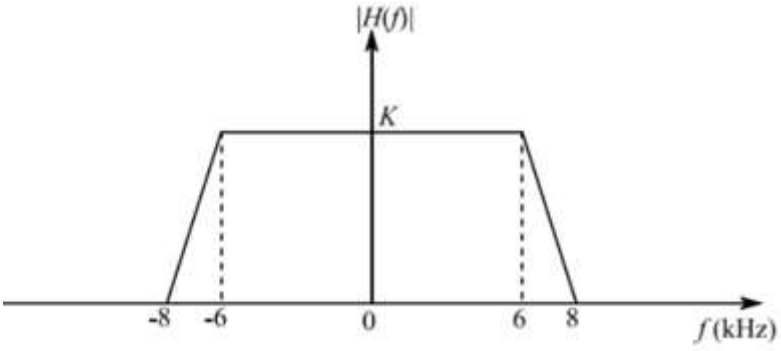
The correct answer is: $(e^{-t} - e^{-3t})u(t)$

Question 4

Correct

Mark 1.00 out of 1.00

A band-limited low-pass signal $x(t)$ of bandwidth 5 kHz is sampled at a sampling rate f_s. The signal $x(t)$ is reconstructed using the reconstruction filter $H(f)$ whose magnitude response is shown below



The minimum sampling rate f_s (in kHz) for perfect reconstruction of $x(t)$ is

Answer: 13 ✓

The correct answer is: 13

Question 5

Correct

Mark 1.00 out of 1.00

The Nyquist sampling frequency (in Hz) of a signal given by $16 \times 10^4 \text{sinc}^2(400t) * 10^6 \text{sinc}^3(100t)$ is $\left(where\ \text{sinc}(\text{t}) = \frac{\sin(\pi t)}{\pi t}\right)$

Select one:

- 100
- 500
- none of the other options are correct
- 300 ✓
- 400
- 800
- 200
- 1000

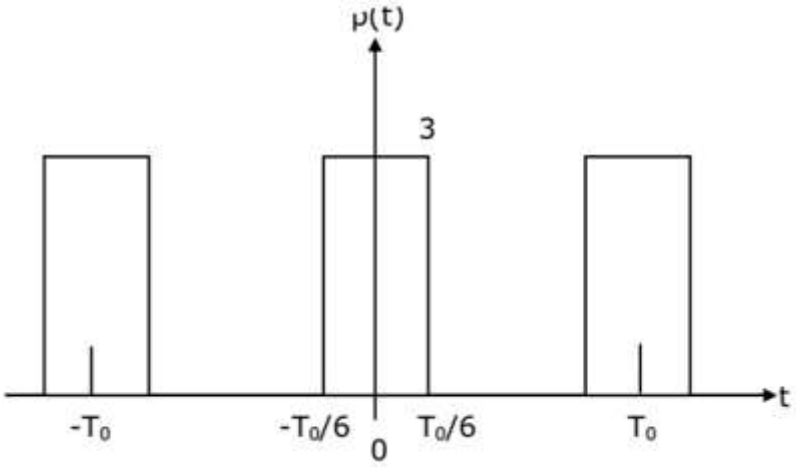
The correct answer is: 300

Question 6

Correct

Mark 2.00 out of 2.00

Let $x(t) = 2\cos(800\pi t) + \cos(1400\pi t)$. $x(t)$ is sampled with the rectangular pulse train shown in figure



This implies that the "sampled signal" is generated by multiplying the signal $x(t)$ by the above periodic signal. The only spectral components (in KHz) present in the sampled signal in the frequency range 2.5 kHz to 3.5 kHz are

Select one:

- 2.6, 2.7
- 3.1, 3.2
- none of the other options are correct
- 2.5, 2.7
- 2.5, 3.3
- 2.85, 3.15
- 2.7, 3.3 ✓
- 3, 3.5

The correct answer is: 2.7, 3.3

Question 7

Correct

Mark 2.00 out of 2.00

The signal $\cos(10\pi t + \frac{\pi}{4})$ is ideally sampled at a sampling frequency of 15Hz (sampling is accomplished by multiplying the signal with an impulse stream). The output of the "sampler" is passed through a filter with impulse response $\frac{\sin(\pi t)}{\pi t}\cos(40\pi t - \frac{\pi}{2})$. The filter output is

Select one:

- $\frac{15}{2}\cos(40\pi t - \frac{\pi}{4})$ ✓
- $\frac{15}{2}\cos(10\pi t - \frac{\pi}{4})$
- $15\cos(40\pi t - \frac{\pi}{4})$
- $\frac{15}{2}\frac{\sin(\pi t)}{\pi t}\cos(10\pi t + \frac{\pi}{4})$
- $\cos(40\pi t - \frac{\pi}{4})$
- none of the other options are correct
- 0
- $\frac{15}{2}\frac{\sin(\pi t)}{\pi t}\cos(40\pi t - \frac{\pi}{2})$

The correct answer is: $\frac{15}{2}\cos(40\pi t - \frac{\pi}{4})$

Question 8

Incorrect

Mark 0.00 out of 1.00

A signal $2\cos(\frac{2\pi}{3}t) - \cos(\pi t)$ is the input to an LTI system with the transfer function $H(s) = e^{s} + e^{-s}$. If C_k denote the k^{th} coefficient in the exponential Fourier series of the output signal, then C_3 is equal to

Answer: 2 ✗

The correct answer is: 1

Question 9

Correct

Mark 1.00 out of 1.00

The transfer function of a system is $\frac{s}{s+2}$. The steady state output $y(t)$ is $A\cos(2t+\psi)$ for the input $\cos(2t)$. The values of A and ψ, respectively are

Select one:

- $\sqrt{2}, -30^o$
- $\sqrt{2}, -45^o$
- $\frac{1}{\sqrt{2}}, +45^o$ ✓
- $\sqrt{2}, +45^o$
- $\frac{1}{\sqrt{2}}, 30^o$
- none of the other options are correct
- $\frac{1}{\sqrt{2}}, -45^o$
- $\frac{1}{\sqrt{2}}, -30^o$

Your answer is correct.

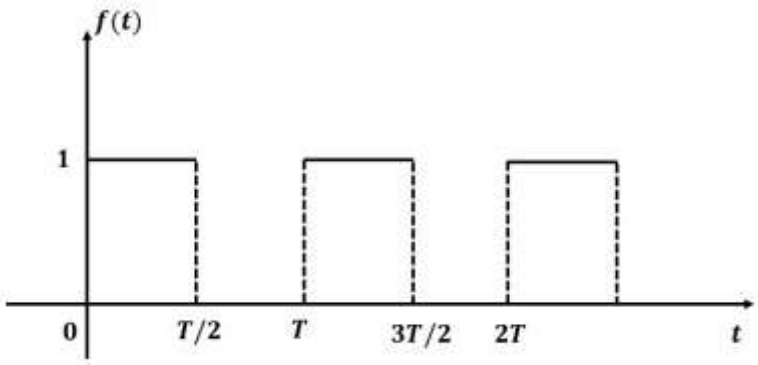
The correct answer is: $\frac{1}{\sqrt{2}}, +45^o$

Question 10

Correct

Mark 1.00 out of 1.00

The Laplace transform of the semi-periodic (one-sided) periodic square wave of fundamental time-period T shown in the figure below is



(note that $x(t)$ is zero for $t < 0$)

Select one:

- $F(s) = \frac{1}{s(1-e^{-sT})}$
- $F(s) = \frac{1}{s(1-e^{-sT})}$
- $F(s) = \frac{1}{1-e^{-sT}}$
- $F(s) = \frac{1}{s(1-e^{-sT/2})}$
- $F(s) = \frac{1}{s(1+e^{-sT/2})}$ ✓
- none of the other options are correct
- $F(s) = \frac{1}{s(1-e^{-sT})}$
- $F(s) = \frac{1}{1+e^{-sT/2}}$

The correct answer is: $F(s) = \frac{1}{s(1+e^{-sT/2})}$

Question 11

Correct

Mark 1.00 out of 1.00

Let $x(t) = \alpha s(t) + s(-t)$ with $s(t) = \beta e^{-4t}u(t)$, where u(t) is unit step function. If the bilateral Laplace transform of x(t) is $X(s) = \frac{16}{s^2-16}$ where $-4 < \Re\{s\} < 4$. Then the value of β is

Answer: -2

The correct answer is: -2

Question 12

Correct

Mark 2.00 out of 2.00

Given the relationship between the input $x(t)$ and the output $y(t)$ to be $y(t) = \int_0^t (2 + t - \tau)e^{-3(t-\tau)}x(\tau)d\tau$, the transfer function $Y(s)/X(s)$ is

Select one:

- $\frac{2s+7}{s+3}$
- none of the other options are correct
- $\frac{2s-7}{(s+3)^2}$
- $\frac{2s+5}{(s+3)^2}$
- $\frac{2s+5}{s+3}$
- $\frac{2s+7}{(s+3)^2}$ ✓
- $\frac{s+2}{(s+3)^2}$
- $\frac{2e^{-2s}}{s+3}$

Your answer is correct.

The correct answer is: $\frac{2s+7}{(s+3)^2}$

◄ Quiz IV DTFT

Jump to...

Quiz VI Z-transforms+sampling ►