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Time taken	49 mins 55 secs
Marks	14.00/15.00
Grade	**3.73** out of 4.00 (**93**%)

Question 1

Correct

Mark 1.00 out of 1.00

Let $g(t) = x(t) + \alpha x(-t)$ where $x(t) = \beta e^{-t}u(t)$ and the Laplace transform of $g(t)$ is $G(s) = \frac{s}{s^2-1}, \qquad -1 < Re\{s\} < 1$

The values of the constants α and β are

Select one:

- a. $\alpha = 1, \beta = \frac{1}{2}$
- b. $\alpha = -1, \beta = -\frac{1}{2}$
- c. $\alpha = -1, \beta = \frac{1}{2}$ ✓
- d. $\alpha = 1, \beta = -\frac{1}{2}$
- e. Incomplete question or none of the options is correct.

Your answer is correct.

The correct answer is: $\alpha = -1, \beta = \frac{1}{2}$

Question 2

Correct

Mark 1.00 out of 1.00

Consider the signal

$$x[n] = \begin{cases} (\frac{1}{3})^n cos(\frac{\pi}{4}n) & n \leq 0 \\ 0 & n > 0 \end{cases}$$

The poles and ROC for $X(z)$ are given by

Select one:

- a. poles at $z = \frac{1}{3}e^{\pm j\frac{\pi}{2}}$, ROC : $|z| < \frac{1}{3}$
- b. poles at $z = \frac{1}{3}e^{\pm j\frac{\pi}{4}}$, ROC : $|z| > \frac{1}{3}$
- c. poles at $z = \frac{1}{3}e^{\pm j\frac{\pi}{2}}$, ROC : $|z| > \frac{1}{3}$
- d. poles at $z = \frac{1}{3}e^{\pm j\frac{\pi}{4}}$, ROC : $|z| \leq \frac{1}{3}$
- e. Incomplete question or none of the options is correct ✓

Your answer is correct.

The correct answer is: Incomplete question or none of the options is correct

Question 3

Correct

Mark 1.00 out of 1.00

Let $x[n]$ be a signal whose rational Z-transform $X(z)$ contains a pole at $z = \frac{1}{2}$. Given that $x_1[n] = (\frac{1}{4})^n x[n]$ is absolutely summable and $x_2[n] = (\frac{1}{8})^n x[n]$ is not absolutely summable. Then, $x[n]$ is

Select one:

- a. Left sided
- b. Right sided
- c. Two sided or both sided ✓
- d. Incomplete question or none of the options is correct

Your answer is correct.

The correct answer is: Two sided or both sided

Question 4

Correct

Mark 1.00 out of 1.00

Consider a discrete time signal given by $x[n] = -0.25nu[n] + 0.5nu[-n-1]$. The region of convergence of its Z-transform would be:

Select one:

- a. Incomplete question or none of the options is correct
- b. the annular region between the two circles, both centered at origin and having radii 0.25 and 0.5. ✓
- c. the region inside the circle of radius 0.5 and centered at origin.
- d. the entire Z plane.
- e. the region outside the circle of radius 0.25 and centered at origin.

Your answer is correct.

The correct answers are: the annular region between the two circles, both centered at origin and having radii 0.25 and 0.5., Incomplete question or none of the options is correct

Question 5

Correct

Mark 1.00 out of 1.00

The Laplace transform of $f(t) = 2\sqrt{t/\pi}$ is $s^{-3/2}$. The Laplace transform of $g(t) = \sqrt{1/\pi t}$ is

Select one:

- a. $\frac{3}{2}s^{-5/2}$
- b. $s^{3/2}$
- c. $s^{1/2}$
- d. Incomplete question or none of the options is correct
- e. $s^{-1/2}$

✓

Your answer is correct.

The correct answer is: $s^{-1/2}$

Question 6

Correct

Mark 1.00 out of 1.00

An input $x(t) = exp(-2t)u(t) + \delta(t-6)$ is applied to an LTI system with impulse response $h(t) = u(t)$. The output is:

Select one:

- a. $0.5[1 - exp(-2t)]u(t) + u(t+6)$
- b. $[1 - exp(-2t)]u(t) + u(t+6)$
- c. $0.5[1 - exp(-2t)]u(t) + u(t-6)$ ✓
- d. $[1 - exp(-2t)]u(t) + u(t-6)$
- e. Incomplete question or none of the options is correct

Your answer is correct.

The correct answer is: $0.5[1 - exp(-2t)]u(t) + u(t-6)$

Question 7

Correct

Mark 1.00 out of 1.00

Let the Laplace transform of a function $f(t)$ which exists for $t > 0$ be $F_1(s)$ and the Laplace transform of its delayed version $f(t-\tau)$ be $F_2(s)$. Let $F_1^*(s)$ be the complex conjugate of $F_1(s)$ with the Laplace variable set as $s = \sigma + j\omega$. If $G(s) = \frac{F_2(s)F_1^*(s)}{||F_1(s)||^2}$, then the inverse Laplace transform of $G(s)$ is:

Select one:

- a. An ideal impulse $\delta(t)$
- b. An ideal delayed impulse $\delta(t-\tau)$ ✓
- c. An ideal delayed step function $u(t-\tau)$
- d. Incomplete question or none of the options is correct
- e. An ideal step function $u(t)$

Your answer is correct.

The correct answer is: An ideal delayed impulse $\delta(t-\tau)$

Question 8

Correct

Mark 1.00 out of 1.00

Suppose $x[n]$ is an absolutely summable discrete-time signal. Its z-transform is a rational function with two poles and two zeroes. The poles are at $z = \pm 2j$. Which of the following statements is TRUE for the signal $x[n]$?

Select one:

- a. It is a periodic signal.
- b. It is a finite duration signal.
- c. It is a causal signal.
- d. It is a non-causal signal. ✓
- e. Incomplete question or none of the options is correct

Your answer is correct.

The correct answer is: It is a non-causal signal.

Question 9

Correct

Mark 1.00 out of 1.00

The input-output relationship of a causal stable LTI system is given as $y[n] = \alpha y[n-1] + \beta x[n]$. If the impulse response $h[n]$ of this system satisfies the condition $\sum_{n=0}^{\infty} h[n] = 2$, the relationship between α and β is

Select one:

- a. Incomplete question or none of the options is correct
- b. $\alpha = 2\beta$
- c. $\alpha = 1 + \beta/2$
- d. $\alpha = -2\beta$
- e. $\alpha = 1 - \beta/2$ ✓

Your answer is correct.

The correct answer is: $\alpha = 1 - \beta/2$

Question 10

Correct

Mark 1.00 out of 1.00

A causal LTI system S with impulse response $h(t)$ has its input $x(t)$ and output $y(t)$ related through a linear constant-coefficient differential equation of the form

$$\frac{d^3y(t)}{dt^3} + (1+\alpha)\frac{d^2y(t)}{dt^2} + \alpha(\alpha+1)\frac{dy(t)}{dt} + \alpha^2 y(t) = x(t)$$

If

$$g(t) = \frac{dh(t)}{dt} + h(t)$$

How many poles does $G(s)$ have?

Answer: 2 ✓

The correct answer is: 2

Question 11

Correct

Mark 1.00 out of 1.00

How many signals have a Laplace transform that may be expressed as $\frac{(s-1)}{(s+2)(s+3)(s^2+s+1)}$ in its region of convergence?

Answer: 4 ✓

The correct answer is: 4

Question 12

Incorrect

Mark 0.00 out of 1.00

The transfer function of a causal LTI system is $H(s) = \frac{1}{s}$. If the input to the system is $x(t) = \frac{sin(t)}{\pi t}u(t)$, where $u(t)$ is a unit step function, the system output $y(t)$ at $t \to \infty$ is 0 ✗ .

The correct answer is: 0.5

Question 13

Correct

Mark 1.00 out of 1.00

The z-transform $X[z]$ of a sequence $x[n]$ is given by $X[z] = \frac{0.5}{1-2z^{-1}}$. It is given that the region of convergence of $X[z]$ includes the unit circle. The value of $x[0]$ is 0 ✓ .

The correct answer is: 0

Question 14

Correct

Mark 1.00 out of 1.00

Let $H_1(z) = (1 - pz^{-1})^{-1}$, $H_2(z) = (1 - qz^{-1})^{-1}$, $H(z) = H_1(z) + rH_2(z)$. The quantities p, q and r are real numbers. Consider $p = \frac{1}{2}$, $q = -\frac{1}{4}$, $|r| < 1$. If the zero of $H(z)$ lies on the unit circle, then $|r| =$ 0.50 ✓ .

The correct answer is: 0.5

Question 15

Correct

Mark 1.00 out of 1.00

Two causal discrete -time signals $x[n]$ and $y[n]$ are related as $y[n] = \sum_{m=0}^{n} x[m]$. If the z-transform of $y[n]$ is $\frac{2}{z(z-1)^2}$, the value of $x[2]$ is 0 ✓ .

The correct answer is: 0

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