Assignment 8

The due date for submitting this assignment has passed. Due on 2020-03-25, 23:59:00.

1. An LTI system whose impulse response in the time domain is given by the following expression, is

\[ r(t) = \frac{1}{(2 + \sigma)^3} \]

- causal and stable.
- causal, but not stable.
- stable, but not causal.
- neither causal nor stable.

Answer: The system is causal and stable.

2. The Laplace transform of the function \( f(t) = e^{-a(t-\tau)} \) is equal to

Select the correct option:

\[ \frac{1}{s+a} \]
\[ \frac{1}{s+a}e^{-a\tau} \]
\[ \frac{1}{s+a}e^{a\tau} \]

Answer: \( \frac{1}{s+a}e^{-a\tau} \)

3. Which of the statements below are false?

\[ \text{I. All even functions are real.} \]
\[ \text{II. All odd functions are imaginary.} \]
\[ \text{III. All real functions are even.} \]

Select the correct option:

- I and II are false.
- I and III are false.
- II and III are false.

Answer: I and II are false.

4. The Laplace transform of \( u(t-a) \) is \( e^{-as} \) where \( a \) is the unit step function.

\[ \frac{1}{s} \]
\[ \frac{1}{s+a} \]
\[ \frac{1}{s-a} \]

Answer: \( \frac{1}{s-a} \)

5. The Laplace transform of \( \text{rect}(t-a) \) is \( \frac{1}{2a} \) where \( a \) is the unit step function.

\[ \frac{\text{sin}(at)}{at} \]
\[ \frac{\text{cos}(at)}{at} \]
\[ \frac{1}{2a} \]

Answer: \( \frac{1}{2a} \)

6. The Laplace transform of \( \mathcal{L}(\text{rect}(t-a)\cdot u(t-a)) \) is \( \frac{1}{2a} \) where \( a \) is the unit step function.

\[ \frac{1}{2a} \]
\[ \frac{1}{2a^2} \]
\[ \frac{1}{2a^3} \]

Answer: \( \frac{1}{2a^3} \)

7. The Laplace transform of \( \mathcal{L}(\text{rect}(t-a)\cdot u(t-a)) \cdot t \) is \( \frac{1}{2a^2} \) where \( a \) is the unit step function.

\[ \frac{1}{2a^2} \]
\[ \frac{1}{2a^3} \]
\[ \frac{1}{2a^4} \]

Answer: \( \frac{1}{2a^4} \)

8. The inverse Laplace transform of \( X(s) = \frac{1}{s^2} + \frac{1}{s+1} \) is \( x(t) = e^{-t} \) for \( t \geq 0 \).

\[ x(t) = e^{-t} \]
\[ x(t) = e^{t} \]
\[ x(t) = e^{-t} + e^{t} \]

Answer: \( x(t) = e^{-t} \)