Assignment 7

The due date for submitting this assignment is 11:59 PM PT. As per our normal grading, you have 11:59 PM PT to complete this assignment.

1. Region of Convergence (ROC) corresponding to the Laplace transform of \( f(t) = e^{-at} \), where \( a \geq 0 \).
   - the unit step signal and it is any arbitrary complex number, \( s \).
   - the ROC is \( \mathbb{C} \setminus [0, \infty) \).
   - the ROC is \( \mathbb{C} \).
   - the ROC is \( s > 0 \).

2. The Laplace transform of \( f(t) = e^{-at} \cos(bt) \) has two poles at \( -b \pm j \sqrt{b^2 - a^2} \) where \( j = \sqrt{-1} \).
   - the ROC is \( \mathbb{C} \setminus [-b, b] \).
   - two poles at \( -\frac{b}{2} \pm j \frac{\sqrt{3}}{2} b \).
   - only one pole at \( -b \).
   - only pole at \( b \).

3. Region of Convergence (ROC) corresponding to the Laplace transform of \( f(t) = e^{-at} \). where \( a > 0 \).
   - the unit step signal and it is any arbitrary complex number, \( s \).
   - the ROC is \( \mathbb{C} \setminus (-\infty, 0) \).
   - the ROC is \( s > 0 \).
   - the ROC is \( s < 0 \).

4. The Laplace transform of \( f(t) = e^{-at} \cos(bt) \) has two poles at \( -\frac{b}{2} \pm j \frac{\sqrt{3}}{2} b \).
   - the ROC is \( \mathbb{C} \setminus [-b, b] \).
   - the ROC is \( \mathbb{C} \).
   - two poles at \( -\frac{b}{2} \pm j \frac{\sqrt{3}}{2} b \).
   - only one pole at \( b \).

5. How many different LT systems can have the same transfer function given by \( H(s) = \frac{1}{(s + 3)(s + 1)} \).
   - different LT systems.
   - the same LT systems.
   - no, the answer is incorrect.
   - Accepted Answer: \( n = 2 \).

6. Which of the following signals would have a Laplace transform given by \( F(s) = \frac{2}{s^2 + 2s + 8} \)?
   - \( f(t) = u(t) \) where \( \frac{1}{2}u(t) \)
   - \( f(t) = e^{-at} \) where \( a > 0 \)
   - \( f(t) = \frac{1}{2} \) u(t)
   - \( f(t) = \frac{1}{2} \) u(t)
   - Accepted Answer: \( f(t) = \frac{1}{2} \) u(t).

7. Which of the following signals would have a Laplace transform given by \( F(s) = \frac{1}{s^2 + 6s + 25} \)?
   - \( f(t) = e^{-at} \) where \( a > 0 \)
   - \( f(t) = e^{-at} \) where \( a > 0 \)
   - \( f(t) = e^{-at} \) where \( a > 0 \)
   - \( f(t) = e^{-at} \) where \( a > 0 \)
   - Accepted Answer: \( f(t) = e^{-at} \) where \( a > 0 \).

8. What is the transfer function of an LT system governed by the following differential equation:
   - \( \frac{1}{s^2 + 2s + 1} \)
   - \( \frac{1}{s^2 + 2s + 1} \)
   - \( \frac{1}{s^2 + 2s + 1} \)
   - \( \frac{1}{s^2 + 2s + 1} \)
   - Accepted Answer: \( \frac{1}{s^2 + 2s + 1} \).