ECE 3337: Signals & Systems Analysis, Class Worksheet 13

1. (40 points) For each of the following inputs $x(t)$, determine the output response $y(t)$ for a system with the following transfer function using the Laplace transform and partial fraction expansions:

$$\mathbf{H(s)} = \frac{2\mathbf{s}+1}{\mathbf{s}^2+2\mathbf{s}+5}$$

a. $x_1(t) = u(t)$

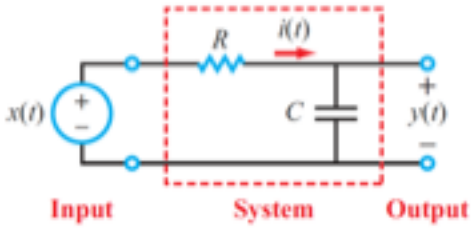
b. $x_2(t) = t\,u(t)$

c. $x_3(t) = e^{-t}u(t)$

d. $x_4(t) = \cos(t)u(t)$

2. (20 points) Using the Laplace transform, redo the convolutions in Table 2-2 of your textbook.

3. (20 points) Using the Laplace transform, solve the differential equation for the RC circuit to derive the unit-step response given that the initial output voltage is 1V.



(a) RC circuit

4. (20 points) Calculate the inverse Laplace transforms for the following signals.

a. $X_1(\mathbf{s}) = 2 + \frac{\mathbf{s}-4}{\mathbf{s}^2+16}$

b. $X_2(\mathbf{s}) = \frac{(\mathbf{s}+5)\mathbf{e}^{-2\mathbf{s}}}{(\mathbf{s}+1)(\mathbf{s}+3)}$