ENGR 203    Fall 2018

Test 1 (10/18/2018)

Total # Pages 5
Total # Problems 5

Name_____________________________________

1. (25 points) ___________
2. (20 points) ___________
3. (10 points) ___________
4. (5 points) ___________
5. (20 points) ___________

Total (80 points) ___________

GOOD LUCK
1. For the functions \( f(t) \) shown determine the Laplace transform \( F(s) = \mathcal{L}\{f(t)\} \). (25 points)

a). \( f(t) = (t-2)\delta(t-1) \)

b). \( f(t) = e^{-t}u(t-2) \)

c).

d). Using the time differentiation property of the Laplace transform show that \( \mathcal{L}\{u(t)\} = \frac{1}{s} \). Recall \( u(t) \) is the time derivative of the unit ramp function \( r(t) \).
2. For the functions $F(s)$ shown find the inverse Laplace transform $f(t)$. (20 points).

   a). $F(s) = \frac{s^2 + s}{s^2 + 1}$

   b). $F(s) = \frac{s + 2}{s^2 (s + 1)}$
3. For the circuit shown there is no energy stored (zero initial conditions). **Derive** the expression for the ratio $V_2(s)/V_1(s)$. (10 points).

4. **Indicate** the poles and zeros of $F(s) = \frac{s+1}{(s+2)(s^2+1)}$ on the pole zero diagram. (5 points).
5. For the circuit shown, $i_L(0^-)|_{1H} = 3 \text{ A}$, $i_L(0^-)|_{3H} = 2 \text{ A}$, and $v_C(0^-) = 1 \text{ V}$. The reference directions are as shown.

   a). **Draw** the circuit in the transform domain from which the mesh currents $I_1(s)$ ($\mathcal{L}\{i_1(t)\}$) and $I_2(s)$ ($\mathcal{L}\{i_2(t)\}$) can be determined. **Label** each component. (10 points)

   b). **Write** the **mesh current equations** that would allow you to solve for $I_1(s)$ and $I_2(s)$. **Do not solve or simplify** any equation. (10 points)