ENGR 203    Fall 2017

Test 1 (10/19/2017)

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). $f(t) = (t-1)\delta(t)$

b). $f(t) = e^{-(t-1)}u(t-2)$

d). Using the time differentiation property of the Laplace transform show that $\mathcal{L}\{u(t)\} = 1/s$. 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). $F(s) = \frac{e^{-s}}{(s + 2)^2 + 1}$

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

![Circuit Diagram]

4. **Indicate** the poles and zeros of \( F(s) = \frac{s + 1}{s(s^2 + 1)} \) on the pole zero diagram. **(5 points)**

![Pole Zero Diagram]
5. For the circuit shown, \( i_L(0^-) = 2 \text{ A} \) and \( v_C(0^-) = 4 \text{ V} \) (all capacitors). 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)**