ENGR 203

Fall 2016

Test 1 (10/20/2016)

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). \( f(t) = (t-2)u(t) \)

   b). \( f(t) = e^{-t}\delta(t-1) \)

   c). \( \)

   d). Using the time differential 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). $F(s) = e^{-3s} \frac{s}{(s + 2)^2 + 1}$

b). $F(s) = \frac{s^2 - s + 1}{s^2 (s + 1)}$
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)**

4. **Indicate** the poles and zeros of $F(s) = \frac{s + 1}{s(s^2 + 1)}$ on the pole zero diagram. **(5 points)**
5. For the circuit shown, \( i_L(0^-) = 1 \text{ A} \) (all inductors) and \( v_C(0^-) = 5 \text{ V} \). 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. (**15 points**).

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