ENGR 203    Spring 2018

Test 1 (04/26/2018)

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 \( F(s) = \mathcal{L}\{f(t)\} \). \((25 \text{ points})\).

a). \( f(t) = tu(t-1) \)

b). \( f(t) = e^{-t}\delta(t-3) \)

c).

d). Using the \textbf{time integration property} of the Laplace transform show that \( \mathcal{L}\{u(t)\} = 1/s \). Recall \( u(t) \) is the time integration of the unit impulse function \( \delta(t) \).
2. For the functions $F(s)$ shown find the inverse Laplace transform $f(t)$. (20 points).

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

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

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

a). **Draw** the circuit in the transform domain from which the node voltages \( V_1(s) \) (\( L\{v_1(t)\} \)) and \( V_2(s) \) (\( L\{v_2(t)\} \)) can be determined. **Label** each component. **(10 points)**

b). **Write** the node voltage equations that would allow you to solve for \( V_1(s) \) and \( V_2(s) \). **Do not solve or simplify** any equation. **(10 points)**