University of Portland
School of Engineering

EE 262
Spring 2015
A. Inan

Homework # 6-Laplace Transform & its Applications

(Assigned: Wednesday, March 25, 2015)
(Due: Wednesday, April 1, 2015, 9:15a.m.)←Not April Fools' joke!!

These problems are assigned from Engineering Signals and Systems by Ulaby/Yeagle (2013) (pages 179-186):

4.6. Laplace transform applied to electric circuits.
4.7. Laplace transform applied to electric circuits.
4.8*. Laplace transform applied to electric circuits.
4.10. Laplace transform applied to electric circuits.
4.13. Laplace transform applied to electric circuits.
4.19. Laplace transform applied to electric circuits.
4.21*. Laplace transform applied to electric circuits.
4.31. Transfer function of an op-amp circuit.
4.33. Transfer function of an op-amp circuit.
***Optional.

Please use the following guidelines for your homework solutions:

1) On the first sheet, at the top center, write: Homework #6-Solutions.
2) Provide your full name on the upper right corner of the first sheet.
3) Also write: EE 262/Spring 2015 on the upper left corner of the first sheet.
4) Solve each problem on a separate sheet unless your solution is very short.
5) Box all of your answers.
6) Staple your solutions in the above order before you turn them in.

Please turn in your homework on time.

Important reminder:

EE 262-Midterm # 2 is on Friday, April 10, 2015, 9:15-10:10a.m.
Closed book exam, formula sheets are allowed.

MATLAB Problems

MATLAB Problem # 1. Laplace transform of a signal. Using MATLAB, find the Laplace transform of the following signals:

(a) $x_1(t) = 7u(t) - 4e^{-t}u(t) - 7te^{-t}u(t) + 3e^{-2t}u(t)$

(b) $x_2(t) = 2\delta(t) - 5e^{-2t}u(t) - 8e^{-t}\cos(3t)u(t) + 3e^{-t}\sin(3t)u(t)$

MATLAB Problem # 2. Inverse Laplace transform of a function. Using MATLAB, find the inverse Laplace transform of the following functions:

(a) $X_1(s) = \dfrac{12}{s(s+1)^2(s+3)}$

(b) $X_2(s) = \dfrac{24}{s(s+4)(s^2+16)}$

(c) $X_3(s) = \dfrac{7s+2}{s^3+6s^2+11s+6}$

MATLAB Problem # 3. Inverse Laplace transform of a function. For the $X(s)$ function given by

$$X(s) = \frac{3s^4 + 29s^3 + 193s^2 + 751s + 896}{s^5 + 15s^4 + 96s^3 + 344s^2 + 687s + 585}$$

Using MATLAB, do the following:

(a) Find the zeros and poles of $X(s)$, and sketch the pole-zero locations on the *s*-plane.

(b) Find the partial-fraction expansion coefficients of $X(s)$.

(c) Find the inverse Laplace transform of $X(s)$ (that is, find $x(t)$).