EGR 261
Signals and Systems
File: N261H2

Due date: _____
(See Due Dates Table)

# HW #2 – Inverse Laplace Transforms

**Reading Assignment:**
Ch. 12, Sect. 1-9 in *Electric Circuits, 9th Edition* by Nilsson
Lathi: Chapter 4, Sections 1-3
Lathi: Sections B.5
Handout: Laplace Transform Properties and Common Laplace Transform Pairs
Lecture notes

**Notes:**
- Avoid using calculators or software to find Laplace Transforms in this assignment since they will not be allowed on the test.
- Use the assigned **Problem Format** specified (refer to HW #1 or see web page for an example).

**Problem Assignment:**
1. Work the following problems from Ch. 12 of *Electric Circuits, 9th Edition* by Nilsson: 41 (parts a, b, c, d only), 42 (parts a, c only)

2. If $f(t) = 4e^{-2t}u(t)$ and $g(t) = 2\cos(3t)u(t)$, determine $f(t) * g(t)$ using Laplace transforms.

3. Find the inverse Laplace transform of the following functions:

A) $F(s)=\frac{6se^{-2s}}{s^2+4s+3}$ B) $F(s) = 2e^{-4s}$ C) $F(s)=\frac{8e^{-3s}}{s^2}$ D) $F(s)=\frac{20se^{-8s}}{s^2+6s+25}$

**MATLAB Problems (Extra Credit):**
Put all problems in a single MATLAB program with an initial block of comments (name, course assignment number, etc) and add a comment identifying each part. Include a printout of the program and the output. Check your results to make sure that they are correct.
1) Use the ***residue()*** function in MATLAB to find the residues for problem 41 (parts a, b, c, d only).
2) Use the ***ilaplace()*** function in MATLAB to find the inverse Laplace transform for problem 41 (parts a, b, c, d only).
3) Use the ***ilaplace()*** function in MATLAB to find the inverse Laplace transform for problem 3 above (all parts).

**Selected Answers:**

12.42a) $f(t)=5\delta(t)+\left[12e^{-2t}-4e^{-4t}\right]u(t)$

2) $f(t) = \frac{8}{13}[-2e^{-2t} + 2\cos(3t) + 3\sin(3t)]u(t)$

3) A) $f(t) = [-3e^{-(t-2)} + 9e^{-3(t-2)}]u(t-2)$

B) $f(t) = 2\delta(t-4)$

C) $f(t) = 8(t-3)^2u(t-3)$

D) $f(t) = e^{-3(t-8)}[20\cos[4(t-8)] - 15\sin[4(t-8)]]u(t-8)$