GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

EE2823A
Homework Assignment No. 7

Date Assigned: February 19, 1999
Date Due:

Reading Assignment: Read pp. 322-378 of Kamen and Heck.

Homework Assignment: Problem 7.1*.

REMEMBER: The second quiz will be given on March 1. It will cover through Problem Set 7.

Problem 7.1*:

Work problem 7.1 parts (c), (d), (e), (f), and (g) in Kamen and Heck.

Problem 7.2:

Determine the Laplace transform of each of the following signals. Be sure to state the region of convergence.

(a) $x_a(t) = 2e^{-2t}u(t) - u(t)$.

(b) $x_b(t) = e^{-2|t|} = e^{-2t}u(t) + e^{2t}u(-t)$.

(c) $x_c(t) = e^{-t}\cos(t)u(t)$.

(d) $x_d(t) = u_1(t-1) + \delta(t-1)$.

(e) $x_d(t) = 2e^{-2t}u(t) - e^{2t}u(t)$

Problem 7.3:

Determine the inverse Laplace transform of each of the following. Do parts (a) and (b) by the partial fraction expansion method. Check your answer using the table of transforms on p. 692 of O and W. Then you should be able to do most of the rest of the work by applying the properties of the Laplace transform in the table on p. 691.

(a) $X_a(s) = \dfrac{1}{s^2+9} \qquad \mathcal{R}e\{s\} > 0$

(b) $X_b(s) = \dfrac{1}{s^2+9} \qquad \mathcal{R}e\{s\} < 0$

(c) $X_c(s) = \dfrac{s}{s^2+9} \qquad \mathcal{R}e\{s\} > 0$

(d) $X_d(s) = \dfrac{se^{-s2}}{s^2+9} \qquad \mathcal{R}e\{s\} > 0$

(e) $X_e(s) = \dfrac{s^2}{s+1} + s + 1 \qquad \mathcal{R}e\{s\} > -1$

Problem 7.4:

Determine the inverse Laplace transform of each of the following. You should be able to do most of the of the work by applying the properties of the Laplace transform in the table on p. 691.

(a) $X_a(s) = \dfrac{1}{s(s+4)} \qquad \mathcal{R}e\{s\} > 0$

(b) $X_b(s) = \dfrac{1}{s(s+4)} \qquad \mathcal{R}e\{s\} < -4$

(c) $X_b(s) = \dfrac{1}{s(s+4)} \qquad -4 < \mathcal{R}e\{s\} < 0$

(d) $X_d(s) = \dfrac{e^{-s2}}{s(s+4)} \qquad \mathcal{R}e\{s\} > 0$

Problem 7.5:

The system function of a *causal* LTI system is

$$H(s) = \frac{s^2}{s^2+4} = \frac{s^2}{(s+j2)(s-j2)}$$

(a) What is the region of convergence of $H(s)$?

(b) Is the system stable?

(c) Determine the impulse response, $h(t)$, of the system.

(d) Determine the input $x(t)$ such that the corresponding output of the system is

$$y(t) = u_1(t-1) = \frac{d\delta(t-1)}{dt}$$