

**Homework No. 6****Due 10:10am, May 9, 2006**

(Please bring your homework to EECS 721.)

3.58 Use the tables of transforms and properties to find the Fourier transforms of the following signals: (30%)

$$(e) \ x(t) = \int_{-\infty}^t \frac{\sin(2\pi\tau)}{\pi\tau} d\tau$$

$$(f) \ x(t) = e^{-t+2}u(t-2)$$

$$(g) \ x(t) = \left(\frac{\sin(t)}{\pi t}\right) * \frac{d}{dt}\left[\frac{\sin(2t)}{\pi t}\right].$$

3.59 Use the tables of transforms and properties to find the inverse Fourier transforms of the following signals: (20%)

$$(e) \ X(\omega) = \frac{2\sin(\omega)}{\omega(j\omega+2)}$$

$$(f) \ X(\omega) = \frac{4\sin^2(\omega)}{\omega^2}.$$

3.68m Determine the frequency response and the impulse response for the systems described by the following differential equations: (20%)

$$(a.m) \ 2\frac{d}{dt}y(t) - 5y(t) = 8x(t)$$

$$(b.m) \ \frac{d^3}{dt^3}y(t) - 3\frac{d}{dt}y(t) - 2y(t) = 3\frac{d^2}{dt^2}x(t) + 8\frac{d}{dt}x(t) - 10x(t).$$

3.75 Evaluate the following quantity: (10%)

$$(d) \ \int_{-\infty}^{\infty} \frac{\sin^2(\pi t)}{\pi t^2} dt.$$

Problem 1. Please determine the output of the system with input  $x(t)$  and impulse response  $h(t)$ . (20%)

$$(a) \ x(t) = e^{-3t}u(t), h(t) = e^{-2t}u(t)$$

$$(b) \ x(t) = e^{-4t}u(t), h(t) = e^{-4t}u(t)$$