

Homework No. 5**Due 11:10 am, May 19, 2005**

3.58 Use the tables of transforms and properties to find the Fourier transforms of the following signals:

$$(a) \quad x(t) = \sin(2\pi t)e^{-t}u(t) \quad (8\%)$$

$$(b) \quad x(t) = te^{-3|t-1|} \quad (8\%)$$

$$(c) \quad x(t) = \left[\frac{2\sin(3\pi t)}{\pi t} \right] \left[\frac{\sin(2\pi t)}{\pi t} \right] \quad (8\%)$$

$$(d) \quad x(t) = \frac{d}{dt}(te^{-2t} \sin(t)u(t)) \quad (9\%)$$

3.59 Use the tables of transforms and properties to find the inverse Fourier transforms of the following signals:

$$(a) \quad X(\omega) = \frac{j\omega}{(1+j\omega)^2} \quad (8\%)$$

$$(b) \quad X(\omega) = \frac{4\sin(2\omega-4)}{2\omega-4} - \frac{4\sin(2\omega+4)}{2\omega+4} \quad (8\%)$$

$$(c) \quad X(\omega) = \frac{1}{j\omega(j\omega+2)} - \pi\delta(\omega) \quad (8\%)$$

$$(d) \quad X(\omega) = \frac{d}{d\omega} \left[4\sin(4\omega) \frac{\sin(2\omega)}{\omega} \right] \quad (9\%)$$

3.68 Determine the frequency response and the impulse response for the systems described by the following differential equations:

$$(a) \quad \frac{d}{dt}y(t) + 3y(t) = x(t) \quad (9\%)$$

$$(b) \quad \frac{d^2}{dt^2}y(t) + 5\frac{d}{dt}y(t) + 6y(t) = -\frac{d}{dt}x(t) \quad (9\%)$$

3.75 Evaluate the following quantities:

$$(b) \quad \sum_{k=-\infty}^{\infty} \frac{\sin^2(k\pi/8)}{k^2} \quad (8\%)$$

$$(c) \quad \int_{-\infty}^{\infty} \frac{8}{(\omega^2+4)^2} d\omega \quad (8\%)$$