

Homework No. 3
Due 18:10, Nov 25, 2010

1. Use the defining equation for the Fourier series coefficients to evaluate the Fourier series representation of the following signal:

$$x(t) = \sum_{m=-\infty}^{\infty} e^{j\frac{2\pi}{7}m} \delta(t - 2m).$$

2. Use the definition of the Fourier series to determine the time-domain signals represented by the following Fourier series coefficients: (15%)

$$X[k] = \left(\frac{-1}{3}\right)^{|k|}, \quad \omega_0 = 1.$$

3. Use the defining equation for the Fourier transform to evaluate the frequency-domain representations of the following signal: (15%)

$$x(t) = te^{-t}u(t).$$

4. Find the frequency response and the impulse response of the system having the output $y(t)$ for the input $x(t)$. (15%)

$$x(t) = e^{-3t}u(t), \quad y(t) = e^{-3(t-2)}u(t-2).$$

5. Determine the frequency response and the impulse response for the system described by the following differential equation: (15%)

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

6. Use the tables of transforms and properties to find the Fourier transforms of the following signals: (25%)

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

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