Homework No. 5

Due 18:10, May 7, 2009

1. Determine the frequency response and the impulse response for the system described by the following differential question:

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

2. Please determine the output of the system with input $x(t)$ and impulse response $h(t)$ for:

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

3. Use the defining equation for the DTFS coefficients to evaluate the DTFS representation of the signal for:

$$x[n]=\cos^2\left(\frac{6\pi}{17}n+\frac{\pi}{3}\right).$$

4. Use the definition of the DTFS to determine the time-domain signal represented by the following DTFS coefficient:

$$X[k]=a_k=2\sin\left(\frac{14\pi k}{19}\right)+\cos\left(\frac{10\pi}{19}k\right)+1.$$

5. Use the defining equation for the DTFT to evaluate the frequency-domain representation of the following signal:

$$x[n]=\left(\frac{2}{5}\right)^n u[n+4].$$

6. Use the equation describing the DTFT representation to determine the time-domain signal corresponding to the following DTFT:

$$X(\Omega)=\sin(\frac{\Omega}{2})+\cos(\Omega).$$