EE306 HW8

4.9 Compute the Fourier transform of the following signals.

(a) $x(n) = u(n) - u(n-6)$

(b) $x(n) = 2^n u(-n)$

(c) $x(n) = (\frac{1}{4})^n u(n+4)$

(d) $x(n) = (\alpha^n \sin \omega_0 n) u(n) \qquad |\alpha| < 1$

4.10 Determine the signals having the following Fourier transforms.

(a) $X(\omega) = \begin{cases} 0, & 0 \le |\omega| \le \omega_0 \\ 1, & \omega_0 < |\omega| \le \pi \end{cases}$

(b) $X(\omega) = \cos^2 \omega$ (be smart here !)

(c) $X(\omega) = \begin{cases} 1, & \omega_0 - \delta\omega/2 \le |\omega| \le \omega_0 + \delta\omega/2 \\ 0, & \text{elsewhere} \end{cases}$

4.28 An FIR filter is described by the difference equation

$$y(n) = x(n) + x(n-10)$$

(a) Derive its frequency response

(b) Determine its response to the inputs

(1) $x(n) = \cos \frac{\pi}{10} n + 3 \sin \left(\frac{\pi}{3} n + \frac{\pi}{10} \right) \qquad -\infty < n < \infty$

(2) $x(n) = 10 + 5 \cos \left(\frac{2\pi}{5} n + \frac{\pi}{2} \right) \qquad -\infty < n < \infty$

Hints:□

* Use properties of LTI systems□

* sin(a)=cos(a-pi/2)