2018 Systems and Signals HW6

Hw6: 5.21(a,c,g), 5.22(a,c,f), 5.25 (due 5/3 after class)

5.21. Compute the Fourier transform of each of the following signals:

(a) $x[n] = u[n-2] - u[n-6]$

(b) $x[n] = (\frac{1}{2})^{-n}u[-n-1]$

(c) $x[n] = (\frac{1}{3})^{|n|}u[-n-2]$

(d) $x[n] = 2^n \sin(\frac{\pi}{4}n)u[-n]$

(e) $x[n] = (\frac{1}{2})^{|n|}\cos(\frac{\pi}{8}(n-1))$

(f) $x[n] = \begin{cases} n, & -3 \le n \le 3 \\ 0, & \text{otherwise} \end{cases}$

(g) $x[n] = \sin(\frac{\pi}{2}n) + \cos(n)$

5.22. The following are the Fourier transforms of discrete-time signals. Determine the signal corresponding to each transform.

(a) $X(e^{j\omega}) = \begin{cases} 1, & \frac{\pi}{4} \le |\omega| \le \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} \le |\omega| \le \pi, 0 \le |\omega| < \frac{\pi}{4} \end{cases}$

(b) $X(e^{j\omega}) = 1 + 3e^{-j\omega} + 2e^{-j2\omega} - 4e^{-j3\omega} + e^{-j10\omega}$

(c) $X(e^{j\omega}) = e^{-j\omega/2}$ for $-\pi \le \omega \le \pi$

(f) $X(e^{j\omega}) = \frac{e^{-j\omega} - \frac{1}{5}}{1 - \frac{1}{5}e^{-j\omega}}$

5.25. Consider the signal depicted in Figure P5.25. Let the Fourier transform of this signal be written in rectangular form as

$$X(e^{j\omega}) = A(\omega) + jB(\omega).$$

Sketch the function of time corresponding to the transform

$$Y(e^{j\omega}) = [B(\omega) + A(\omega)e^{j\omega}].$$

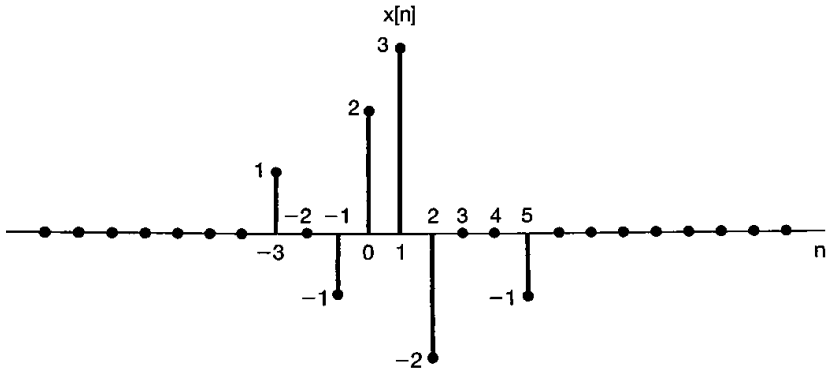

Fig P5.25