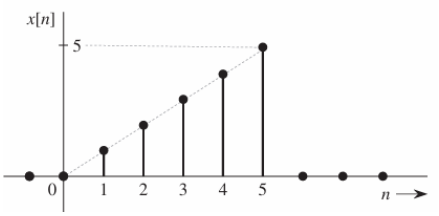
CSE 351 – SIGNALS AND SYSTEMS

ASSIGNMENT 2

1. Find the inverse z-transforms of
   a. $\frac{8z-19}{(z-2)(z-3)}$
   b. $\frac{z(2z^2-11z+12)}{(z-1)(z-2)^3}$

2. Find the z-transform of the signal x[n] depicted below.

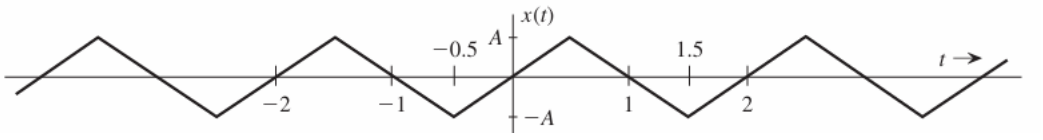


3. Find the response y[n] of an LTID system described by the difference equation:

$$y[n+2] + y[n+1] + 0.22y[n] = x[n+1] + 0.44x[n]$$

for the input $x[n] = (-2)^{-n}u(n)$ with all the initial conditions zero (system in zero state).

4. Find the compact trigonometric Fourier series for the triangular periodic signal x(t) shown below,and sketch the amplitude and phase spectra for x(t).



5. Determine the fundamental frequency and period of the following signals:

   a. $x(t) = 2 + 7\cos\left(\frac{1}{2}t + \theta_1\right) + 3\cos\left(\frac{2}{3}t + \theta_2\right) + 5\cos\left(\frac{7}{6}t + \theta_3\right)$
   b. $x(t) = 2\cos(2t + \theta_1) + 5\sin(\pi t + \theta_2)$
   c. $x(t) = 3\sin\left(3\sqrt{2t} + \theta\right) + 7\cos(6\sqrt{2t} + \phi)$

6. Find the Fourier transform of $e^{-a|t|}$.

7. Using the time-shifting property, find the Fourier transform of $e^{-a|t-t_0|}$.

8. Consider a signal $x(t) = sinc^2(5\pi t)$ whose spectrum is $X(\omega) = 0.2\Delta\left(\frac{\omega}{20\pi}\right)$. Plot the frequency spectrum when $f_s = 5, 10, 20$ Hz.

9. A continuous-time sinusoid $cos(2\pi ft + \theta)$ is sampled at a rate $f_s = 1200$ Hz. Determine the apparent (aliased) sinusoid of the resulting samples if the input signal frequency f is (a) 200 Hz, (b) 600 Hz, (c) 1000 Hz, and (d) 2400 Hz.

10. A signal $x[n] = sinc(\pi n/4)$ modulates a carrier $\cos\Omega_c n$.Find and sketch the spectrum of the modulated signal $x[n]\ \cos\Omega_c n$ for $\Omega_c = \frac{\pi}{2}$.