1. Computer the Fourier transform of the following signals.
   (a) \( x(n) = \delta(n) + \delta(n-2) + u(n) - u(n-2) \)
   (b) \( x(n) = \{-1,2,3,2,1\} \)
   (c) \( x(n) = a^n \sin(\omega_0 n) \ u(n), \ |a|<1 \)
   (d) A signal \( x(n) \) has the Fourier transform \( X(w) \), determine the Fourier transform of \( y(n) = x(n) \sin(\omega_0 n) + x(n-1) \), where \( X(\omega) = \frac{1}{1 - 0.8e^{-j\omega}}. \)

2. For the sequence, \( N=6 \). \( x_1(n) = \cos\left(\frac{2\pi n}{N}\right) + \delta(n) \), and \( x_2(n) = u(n) - \delta(n-1) \), \( 0 \leq n \leq N - 1. \)
   (a) Suppose \( N=6 \). Determine the \( N \)-point DFT of \( x_1(n) \).
   (b) Determine the \( 2N \)-point DFT of \( x_1(n) \) by zero-padding first. What is their relationship?

3. Determine the 8-point DFTs of the following signals
   (a) \( x(n) = \{1,0,1,0,0,0,0,0\} \).
   (b) \( x(n) = a^n, \ |a|<1, 0\leq n \leq 7. \)

4. Consider the sequence \( x_1(n) = \{1, 1, 0, 0\} \) and \( x_2(n) = \{1, 1, 3, 6\} \).
   (a) Given the 4-point DFT of the sequence \( x_1(n) \), compute the DFT of the sequence \( y(n) = \{1,0,0,1\} \).
   (b) Determine a sequence \( y(n) \) such that \( Y(k) = X_1(k)X_2(k) \).
   (c) Calculate the linear convolution \( x_1(n)*x_2(n) \) by using DFT.