Assignment - 2

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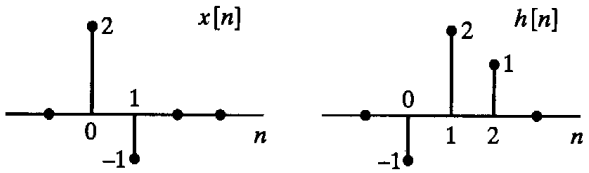
***Abstract*—This document contains the solution to Exercise 2.22 (b) of Oppenheim.**

Problem 1. For each of the pairs of sequences in Figure, use the discrete convolution to find the response to the input x[n] of the linear time-invariant system with impulse response h[n].



(b)

Solution: As we know the to compute the convolution:

$$y(n) = x(n) * h(n) = \sum_{n=-\infty}^{\infty} x(k)h(n-k) \tag{1}$$

Given that

$$x[n] = \{0, 2, -1, 0, 0\} \tag{2}$$

$$h[n] = \{0, -1, 2, 1, 0\} \tag{3}$$

Now we will compute the values of y[n]

$$y[n] = \sum_{n=-\infty}^{\infty} x(k)h(n-k) \tag{4}$$

$$y[-1] = x(-1)h(0) + x(0)h(-1) = 0 \tag{5}$$

$$y[0] = x(-1)h(1) + x(0)h(0) + x(1)h(-1) = -2 \tag{6}$$

$$y[1] = x(-1)h(2) + x(0)h(1) + x(1)h(0) + x(2)h(-1) = 5 \tag{7}$$

$$y[2] = x(-1)h(3) + x(0)h(2) + x(1)h(1) + x(2)h(0) + x(3)h(-1) = 0 \tag{8}$$

$$y[3] = x(0)h(3) + x(1)h(2) + x(2)h(1) = -1 \tag{9}$$

Hence we have y[n] as

$$y[n] = \{0, -2, 5, 0, -1\} \tag{10}$$