Problem 1. Consider the DT LTI systems with the following input-output relationships:

(i) \( y[k] = x[k - 1] + 2x[k - 3] \)
(ii) \( y[k + 1] - 0.4y[k] = x[k] \).

Calculate the impulse responses for the two DT LTI systems. Also, determine the output responses of the DT LTI systems when the input is given by
\[ x[k] = 2\delta[k] + 3\delta[k - 1]. \]

Problem 2. The impulse response of a DT LTI system is given by
\[ h[k] = 0.5^k u[k]. \]

Determine the output of the system for the input sequence
\[ x[k] = \delta[k - 1] + 3\delta[k - 2] + 2\delta[k - 6]. \]

Problem 3. Assuming that the impulse response of a DT LTI system is given by
\[ h[k] = 0.5^k u[k], \]
determine the output response \( y[k] \) to the input sequence
\[ x[k] = 0.8^k u[k]. \]

Problem 4. For the following DT sequences:
\[ x[k] = \begin{cases} 2, & 0 \leq k \leq 2 \\ 0, & \text{otherwise} \end{cases} \]
\[ h[k] = \begin{cases} k + 1, & 0 \leq k \leq 4 \\ 0, & \text{otherwise} \end{cases} \]
calculate the convolution sum \( y[k] = x[k] \ast h[k] \).

Problem 5. For the following pair of the input sequence \( x[k] \) and impulse response \( h[k] \)
\[ x[k] = \begin{cases} -1, & k = -1 \\ 1, & k = 0 \\ 2, & k = 1 \\ 0, & \text{otherwise} \end{cases} \]
\[ h[k] = \begin{cases} 3, & k = -1, 2 \\ 1, & k = 0 \\ -2, & k = 1, 3 \\ 0, & \text{otherwise} \end{cases} \]
calculate the output response.

**Problem 6.** Oppenheim & Willsky, problem 2.5.

**Problem 7.** Oppenheim & Willsky, problem 2.6.

**Problem 8.** Oppenheim & Willsky, problem 2.21.