Question#1: For the following Signal x[n]:

$$x[n] = \begin{cases} 1, n = 1\ldots.10 \\ 0, Otherwise \end{cases}$$

1. Calculate and plot the Spectrum.

2. Compute the output $y[n]$ for the length-4 filter (**M=3**) whose coefficients are $\{bk\}$ = {3, -1, 2, 1}. The causal running average is a special case of the general causal difference equation

$$y[n] = \sum_{k=0}^{M} b_k x[n-k] \qquad (1)$$

where the coefficients bk are fixed numbers, usually the bk coefficients are not all the same, and then we say that Equation (1) defines a *weighted running average* of $M + 1$ samples.

Question 2: Exploring Minimum-Phase and All-Pass Systems in MATLAB

Using the MATLAB filter design tool, **design your own example of**

1- A minimum phase system
2- An all-pass system

Use the tool to generate the magnitude response, phase response, group delay, difference equation and Pole-Zero diagram.

What do you observe about the **magnitude** responses?

How do the **phase** responses differ?