

## Analysis of Discrete-Time Systems Partial Solution

The four systems assigned in this project are as follows:

- **System 1:**

$$y[n] = (x[n] + x[n - 3])^2$$

This system is (i) not memoryless, (ii) causal, (iii) BIBO stable, (iv) non-linear, (v) time-invariant.

- **System 2:**

$$y[n] = ((2^n)x[n] + x[n + 1])u[n]$$

This system is (i) not memoryless, (ii) non-causal, (iii) BIBO unstable, (iv) non-linear, (v) time-variant.

- **System 3:**

$$y[n] = (0.1) * (x[n] + x[n - 1] + x[n - 2] + \dots + x[n - 9])$$

This system is (i) not memoryless, (ii) causal, (iii) BIBO stable, (iv) linear, (v) time-invariant.

- **System 4:**

$$y[n] = 5\text{sign}(x[n]) = \begin{cases} -5 & \text{if } x[n] < 0 \\ 0 & \text{if } x[n] = 0 \\ 5 & \text{if } x[n] > 0 \end{cases}$$

This system is (i) memoryless, (ii) causal, (iii) BIBO stable, (iv) non-linear, (v) time-invariant.