**Fayoum University**
**Faculty of Computers & Information**
**Second Year**
**Digital Signal Processing**
**Year 2020 / 2021**

# Sheet 2

1- Determine which of the following systems is a linear system.
(a) $y(n)=5x(n)+2x^2(n)$
(b) $y(n)=x(n-1)+4x(n)$

2- Determine the causality for each of the following linear systems.
(a) $y(n)=0.5x(n)+20x(n-2)-0.1y(n-1)$
(b) $y(n)=x(n+2)-0.4y(n-1)$

3- Check the following systems with respect to: time invariance, linearity, causality. Also, determine if any of them is with memory.

a. $y[n]=x2[n-1]$
b. $y[n]=x[-n+2]$

4-

Given the sequence

$$h(k)=\begin{cases}2, & k=0,1,2\\ 1, & k=3,4\\ 0 & \text{elsewhere}\end{cases}$$

where $k$ is the time index or sample number,
**(a)** sketch the sequence $h(k)$ and the reverse sequence $h(-k)$;
**(b)** sketch the shifted sequences $h(-k+2)$ and $h(-k-3)$.

5-

Using the sequence definitions

$$h(k) = \begin{cases} 2, & k = 0, 1, 2 \\ 1, & k = 3, 4 \\ 0 & elsewhere \end{cases} \quad and \; x(k) = \begin{cases} 2, & k = 0 \\ 1, & k = 1, 2 \\ 0 & elsewhere \end{cases}$$

evaluate the digital convolution

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

**a.** using the graphical method;

**b.** using the table method;