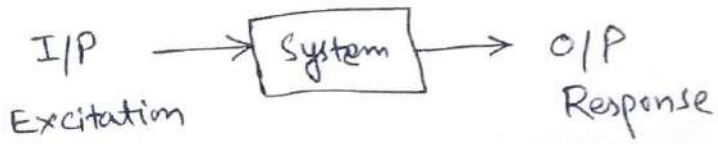
System:-

To process something is called system.

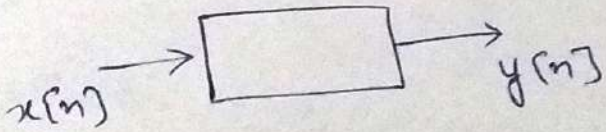
e.g Filter



⊛ System is a physical device that perform an operation on a signal.

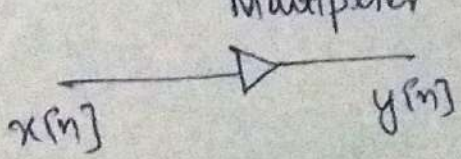
⊛ Discrete Time System:-

Discrete Time input & Discrete time output



Block diagram representation of Discrete Time System (DTS)

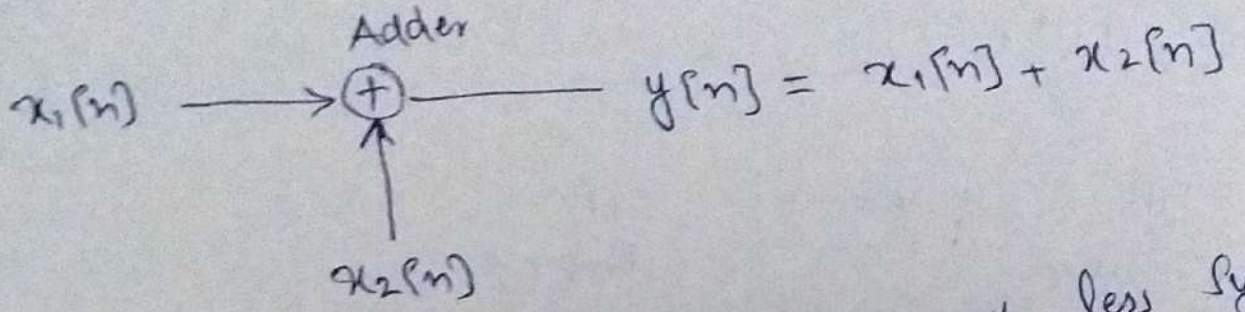
⇒ A D.T.S which has one input and one output.



∴ Multiplier is a Memory less System.

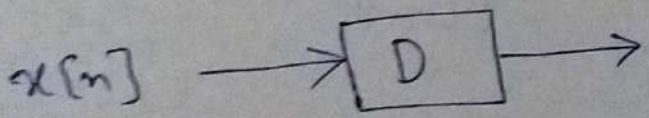
Ahmi

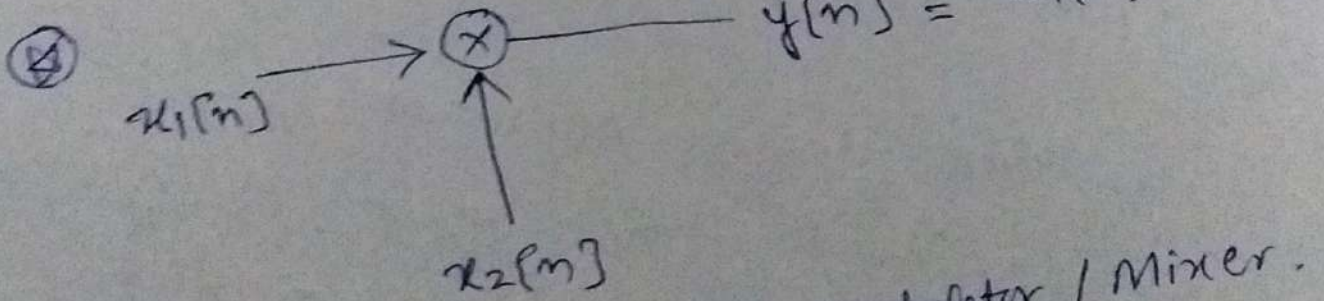
⇒ A D.T.S which has more than one input and one output.



∴ This is also a memory less system.

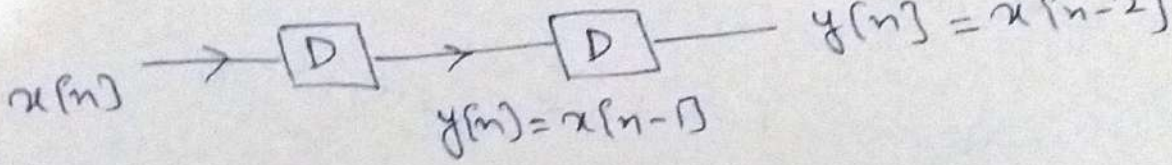
⇒ Another example of one input and one output is Time delay / Unit delay.





This is called Signal Modulator / Mixer.

(*) If there are more than one delay occurs in a system.



(*) Capacitor is a memory system.

$$C = \frac{1}{2} C V^2$$

(*) Inductor is also memory system.

$$L = \frac{1}{2} L I^2$$

(#) Mathematical Representation:-

DTS is described by a difference equation.

Difference = n

$$\sum_{K=0}^{N} a_K \, y[n-K] = \sum_{K=0}^{M} b_K \, x[n-K]$$

This is Linear Constant Coefficient Difference Equation

Ahmi

Where as $y[n]$ is output and

$x[n]$ is input

a_k and b_k is the coefficients

$a_k \Rightarrow$ Feed back coefficient

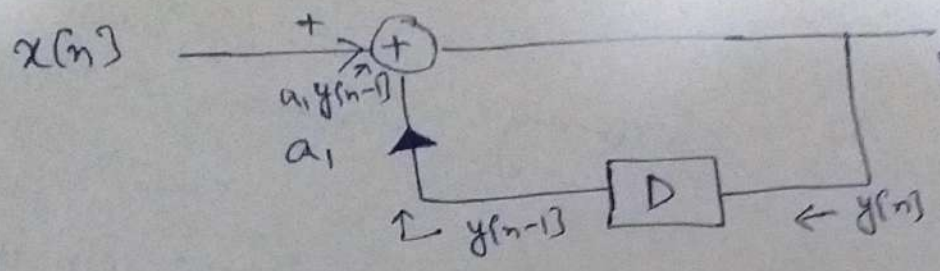
$b_k \Rightarrow$ Feed forward coefficient

$\Rightarrow$ Order is of that which one is more / maximum i-e N or M.

$\Rightarrow$ The maximum delays is the order of the system.

$\therefore$ And when a signal is continuous it is represented by differential equation.

(8)



$y[n] = x[n] + a_1 y[n-1]$

⇓

Difference equation

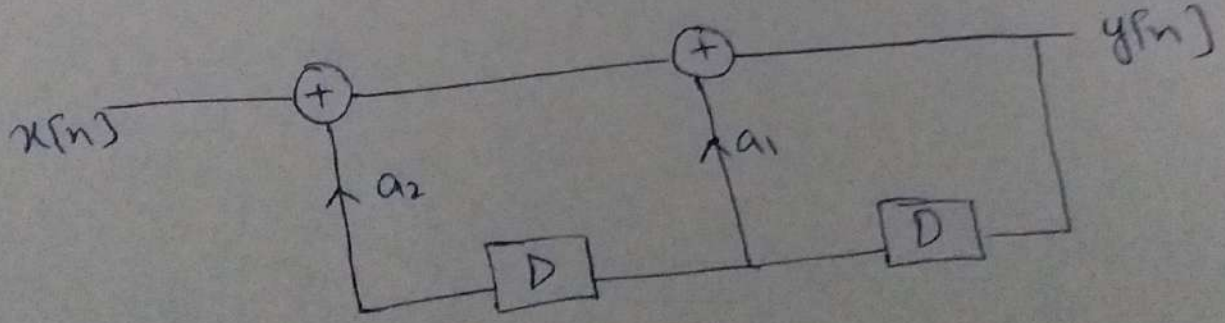
Maximum order is the maximum numbers of delay

∴ ^ is used for Multiplier

So here 1 delay occurs

So order of a system is 1.

(9)



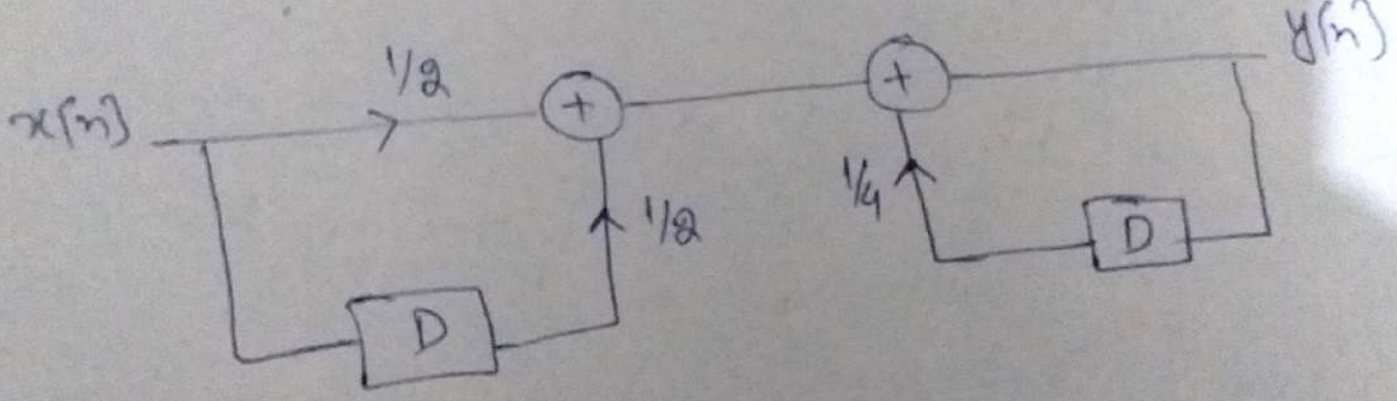
$y[n] = x[n] + a_2 y[n-2] + a_1 y[n-1]$

order of system is 2.

Ahmi

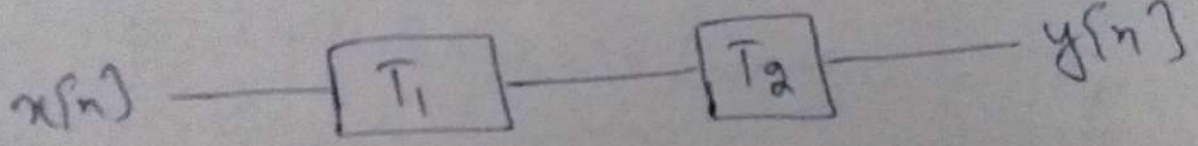
(#) Draw System/ Block diagram for the following equation.

$$y[n] = \frac{1}{4} y[n-1] + \frac{1}{2} x[n] + \frac{1}{2} x[n-1]$$



(b) Interconnection of L.T.I.S :-

1) Series (cascaded) connection



2) Parallel connection