Quiz - 2.
ECE - 301

1. $y[n] = x[n+1] + x[n+2]$

a) $\Rightarrow h[n] = \delta[n+1] + \delta[n+2]$

b) $x[n] = u[n+3] - u[n+4] = \delta[n+3]$.

$= -\delta[n+4]$.

$y[n] = x[n] * h[n] = -\delta[n+5] - \delta[n+6]$

c). (i) Not causal. Output depends on future values of input.

(ii) Not memoryless.

(iii). Yes. Only finite summation of x.

$\therefore$ If $x[n]$ is finite, $y[n]$ is finite.

(iv) No.

$x[n] = 1 \ \forall n. \quad y[n] = 2 \ \forall n.$

$x[n] = \begin{cases} 2 & \text{if } n \text{ is even} \\ 0, & \text{o.w.} \end{cases} \quad y[n] = 2 \ \forall n.$

2 different inputs give same output.

d. (i) No. Depends on future values of input.

(ii) No.

(iii) No. $y[n] = \sum_{i=n+1}^{\infty} x[i]$.

For $x[n] = 1 \ \forall n$. $x[n]$ is ~~finite~~ bounded. But $y[n]$ is not. Not stable.

(iv). $y[n] = \sum_{i=n+1}^{\infty} x[i]$.

$y[n+1] = \sum_{i=n+2}^{\infty} x[i]$.

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

$\Rightarrow y[n-1] - y[n] = x[n]$.

Inverse system $\Rightarrow$ $\boxed{y'[n] = x'[n-1] - x'[n].}$

2. ~~If~~ $x[n] = \delta[n]$.

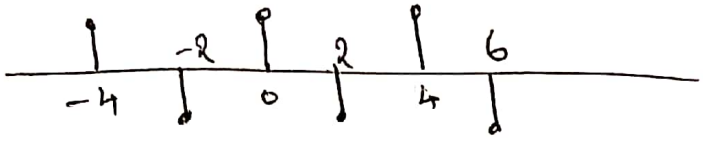
$$y[n] = \delta[n].$$

$$x[n] = \delta[n-2].$$

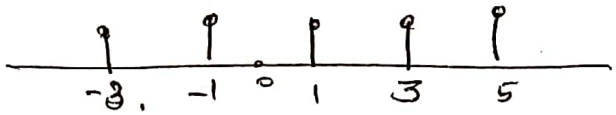
$$y[n] = \delta[n].$$

It should have been $\delta[n-2]$ if the system was time invariant. ∴ It is not time invariant.

Even k. $x_1[n]$



~~Since~~, odd k. $x_2[n]$.



∴ System is linear

$x_1[n] \rightarrow \square \rightarrow y_1[n]$

$x_2[n] \rightarrow \square \rightarrow y_2[n] \Longrightarrow x_1[n]+x_2[n] \rightarrow \square \rightarrow y_1[n]+y_2[n]$.

$y_1[n] = 0$

$y_2[n] = 5\,\delta[n-1]$.

$y[n] = y_1[n] + y_2[n] = 5\,\delta[n-1]$.