

$$\textcircled{a) } y(n) = x(-n+2)$$

$$y(1) = x(-1+2) = x(1)$$

$$y(0) = x(0+2) = x(2)$$

$$y(-1) = x(1+2) = x(3)$$

O/p depends on future I/P
 \therefore Dynamic

Stable and Unstable System

* A system is said to be unstable if and only if every bounded input produces the bounded output.

A stable system is also known as BIBO stable system.

* A system is said to be stable, if the bounded input $x(t)$ produces the bounded output $y(t)$

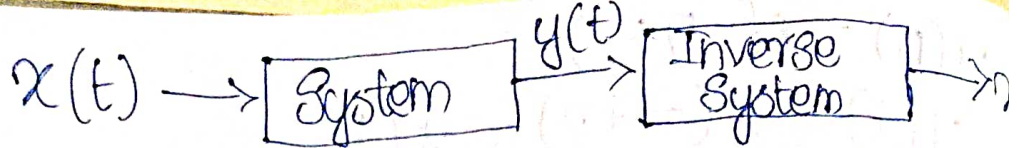
if $|x(t)| \leq M_x < \infty$ for all t
 then $|y(t)| \leq M_y < \infty$ for all t

\Rightarrow Condition for stability:

$$\sum_{n=-\infty}^{\infty} |h(n)| < \infty$$

Inverse System (or) Invertability:

A system is said to be inverse system if there is unique output for every unique input.



Check for stability:

$$\textcircled{1} h(n) = nu(n)$$

$$= \sum_{n=-\infty}^{\infty} |nu(n)|$$

$$= \sum_{n=0}^{\infty} n$$

$$= 0 + 1 + 2 + \dots + \infty$$

$$= \infty$$

$$\textcircled{2} h(n) = 2^n u(n-3)$$

$$= \sum_{n=-\infty}^{\infty} |h(n)|$$

$$= \sum_{n=-\infty}^{\infty} [2^n u(n-3)]$$

$$= \sum_{n=3}^{\infty} |2^n|$$

$$= 2^3 + 2^4 + \dots + 2^{\infty}$$

$$= \infty$$

$$\textcircled{3} h(n) = 3^n u(-n)$$

$$= \sum_{n=-\infty}^{\infty} |h(n)|$$

$$= \sum_{n=-\infty}^{\infty} |3^n u(-n)|$$

$$= \sum_{n=-\infty}^{\infty} 3^n$$

$$= \sum_{n=0}^{\infty} 3^{-n} = \sum_{n=0}^{\infty} \left(\frac{1}{3}\right)^n$$

$$= 1 + \frac{1}{3} + \left(\frac{1}{3}\right)^2 + \dots$$

$$= \frac{1}{1 - \frac{1}{3}} = \frac{3}{2} \quad \text{Stable System.}$$

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Verify the properties of system:

$$\textcircled{P} \quad y(n) = x(n) u(n)$$

$$y_1(n) = x_1(n) u(n)$$

$$y_2(n) = x_2(n) u(n)$$

$$y_3(n) = a_1 x_1(n) u(n) + a_2 x_2(n) u(n)$$

$$y_3'(n) = u(n) [a_1 x_1(n) + a_2 x_2(n)]$$

$$= a_1 x_1(n) u(n) + a_2 x_2(n) u(n)$$

$$y_3(n) = y_3'(n)$$

\therefore Linear System

$$y(n, n_1) = x(n - n_1) u(n)$$

$$y(n - n_1) = x(n - n_1) u(n - n_1)$$

$$y(n, n_1) \neq y(n - n_1)$$

\therefore Time Variant

$$y(0) = x(0) u(n)$$

$$y(1) = x(1) u(n)$$

$$y(-1) = x(-1) u(n)$$

O/P depends on present I/P

\therefore Causal & Static

