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

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

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

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

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.

$$x(t) \rightarrow \boxed{\text{System}} \xrightarrow{y(t)} \boxed{\text{Inverse System}} \rightarrow$$

Check for stability:

① $h(n) = n\,u(n)$

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

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

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

$$= \infty$$

② $h(n) = 2^n\,u(n-3)$

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

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

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

$$= 2^3 + 2^4 + \ldots 2^\infty$$

$$= \infty$$

③ $h(n) = 3^n\,u(-n)$

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

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

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

$$= \sum_{n=0}^{\infty} 3^{-n} = \sum_{n=0}^{\infty} (1/3)^n$$

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

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

Vsta

Verify the properties of system:

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

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

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

$y_3(n) = a_1 x_1(n) u(n) + a_2 x_1(n)\, u(n)$

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

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

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

$\therefore$ 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