S&S QUIZ-2 SOLUTIONS

SOL(1):

(a)
$$I = \int_{-\infty}^{\infty} 2 \sin(t) \cdot \delta\left(t - \frac{\pi}{2}\right) \cdot dt$$

$$= 2 \sin\left(\frac{\pi}{2}\right)$$
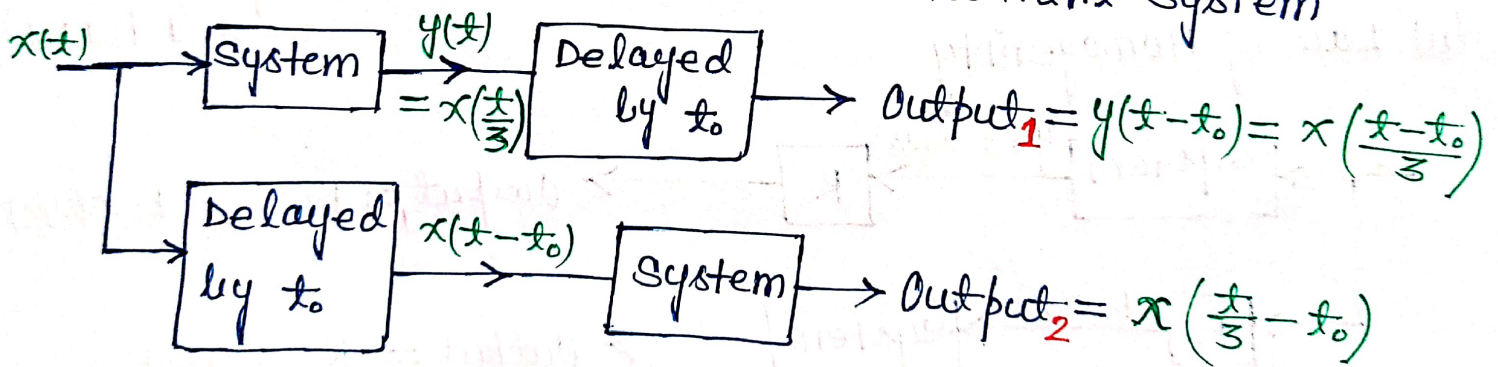
$$= 2 \qquad \rightarrow (2 \text{ POINTS})$$

By using the Property,
$$\int_{-\infty}^{\infty} x(t) \cdot \delta(t - t_1) \, dt = x(t_1)$$

(b)
$$2 \sin(t) \cdot \delta\left(t - \frac{\pi}{2}\right)$$

$$= 2 \sin\left(\frac{\pi}{2}\right) \cdot \delta\left(t - \frac{\pi}{2}\right)$$

$$= 2 \, \delta\left(t - \frac{\pi}{2}\right) \qquad \rightarrow (2 \text{ POINTS})$$

By using the Property,
$$x(t) \cdot \delta(t - t_1) = x(t_1) \cdot \delta(t - t_1)$$

SOL(2):

Given system $y(t) = x\left(\frac{t}{3}\right)$

Part-I — Check for Time Variant / Time Invariant System

$x(t) \rightarrow$ System $\xrightarrow{y(t) = x\left(\frac{t}{3}\right)}$ Delayed by t_0 $\rightarrow$ Output$_1 = y(t - t_0) = x\left(\frac{t - t_0}{3}\right)$

$\rightarrow$ Delayed by t_0 $\xrightarrow{x(t - t_0)}$ System $\rightarrow$ Output$_2 = x\left(\frac{t}{3} - t_0\right)$

Both the output are not same, hence Time Variant System.

$$\rightarrow (2 \text{ POINTS})$$

Part-II — Check for With memory / without memory system

Here output of the system $[y(t)]$ depends on past, present & future value of input, hence With Memory System.

$$\rightarrow (2 \text{ POINTS})$$

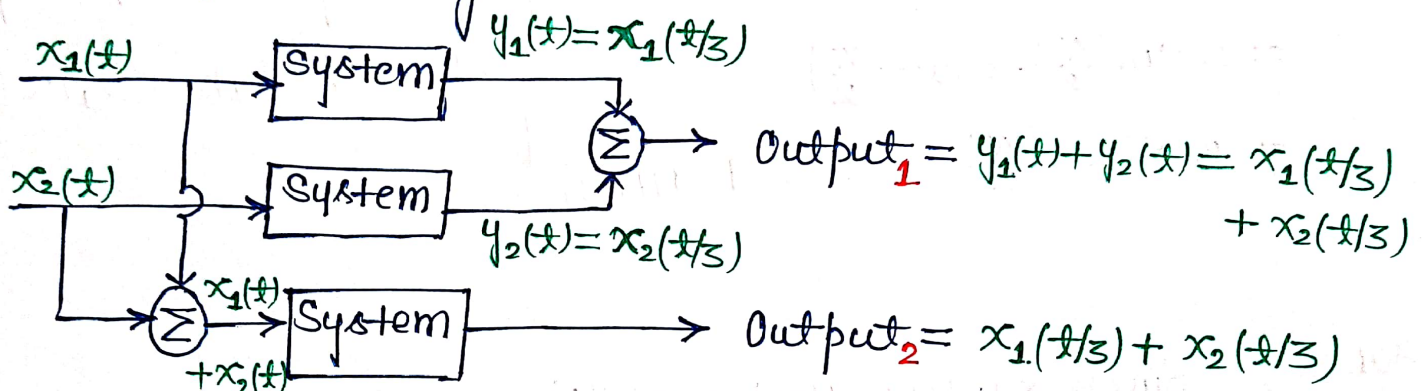**Example:** Given System $y(t) = x(t/3)$

at $t = (-3)$, $y(-3) = x(-1)$ Depends on Future i/p

at $t = (0)$, $y(0) = x(0)$ "   " Present i/p

at $t = (6)$, $y(6) = x(2)$ "   " Past i/p
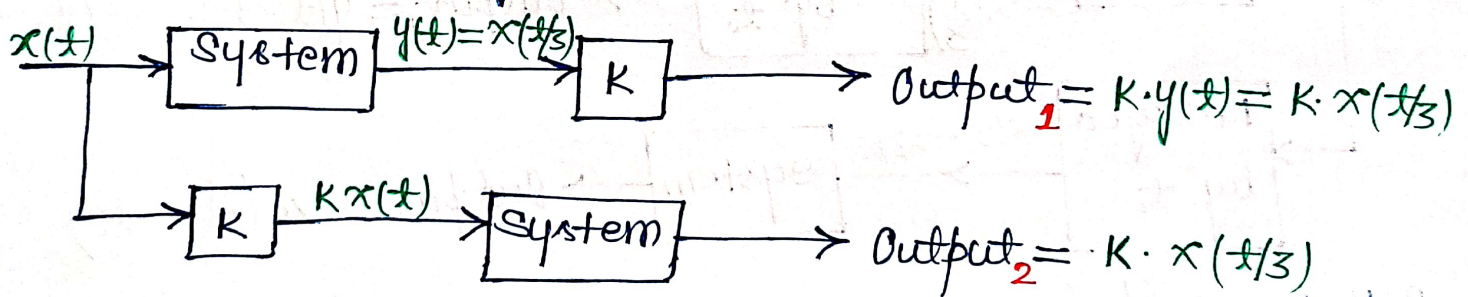
Part-III – Check for Linear / Non-Linear System

(a) Law of additivity

$$y_1(t) = x_1(t/3)$$

$$Output_1 = y_1(t) + y_2(t) = x_1(t/3) + x_2(t/3)$$

$$y_2(t) = x_2(t/3)$$

$$Output_2 = x_1(t/3) + x_2(t/3)$$

Both the output are same hence follow additivity.

$\longrightarrow$ (1 POINT)

(b) Law of Homogenity

$$Output_1 = K \cdot y(t) = K \cdot x(t/3)$$

$$Output_2 = K \cdot x(t/3)$$

Both the output are same hence follow Homogenity.

$\longrightarrow$ (1 POINT)

Hence the given system is Linear System.