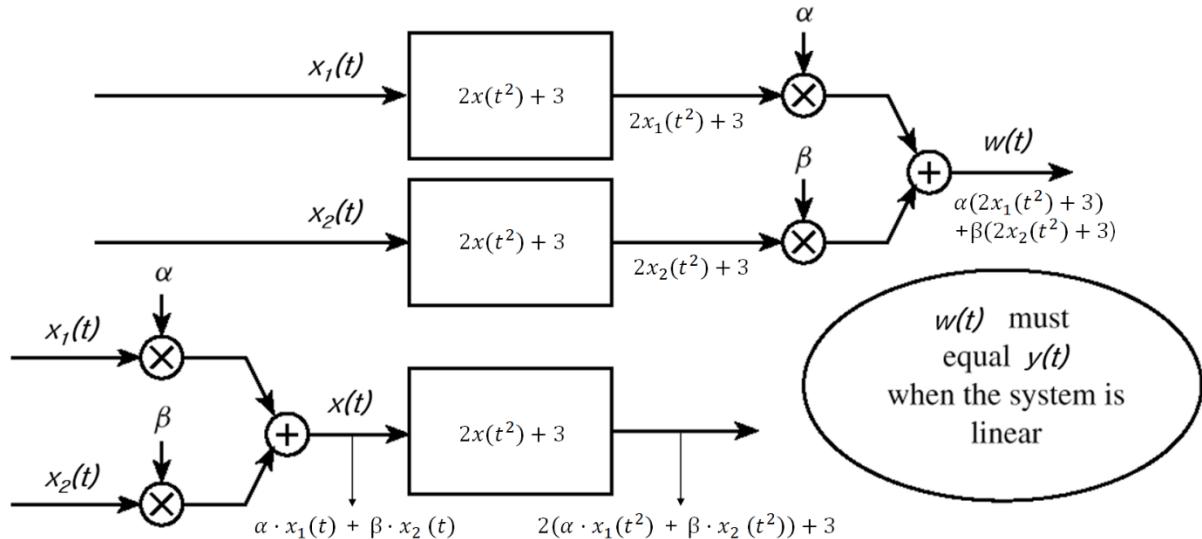


2020 年 신호처리 과제 10 답안

1. 다음 함수의 LTI 여부를 판별하시오.

$$y(t) = 2x(t^2) + 3$$

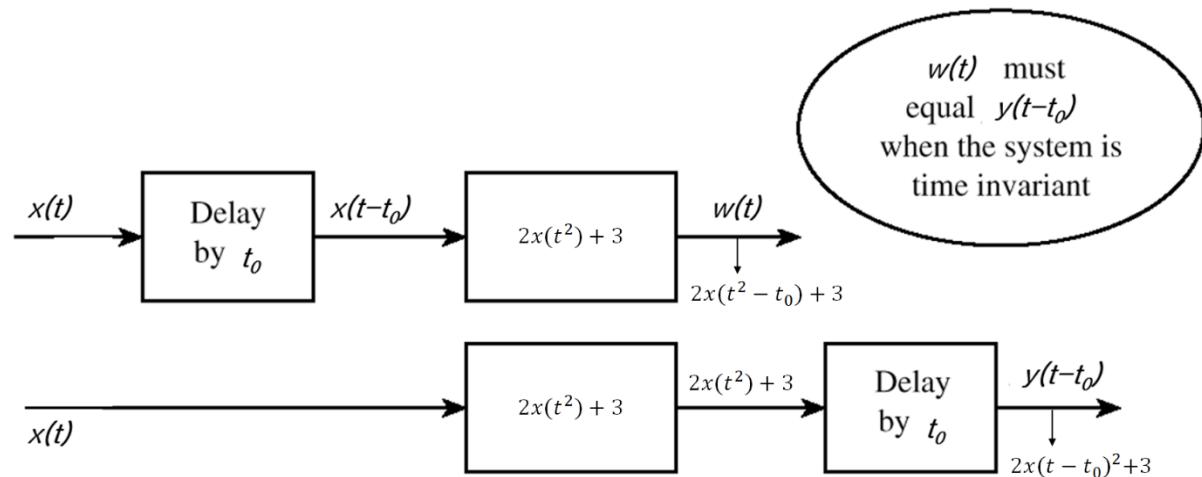
(1) Linear and Nonlinear Systems



$$\therefore w(t) = \alpha(2x_1(t^2) + 3) + \beta(2x_2(t^2) + 3) \text{ and } y(t) = 2(\alpha \cdot x_1(t^2) + \beta \cdot x_2(t^2)) + 3 \rightarrow w(t) \neq y(t)$$

\therefore The system is Non-linear

(2) Time-Varying and Time-Invariant System

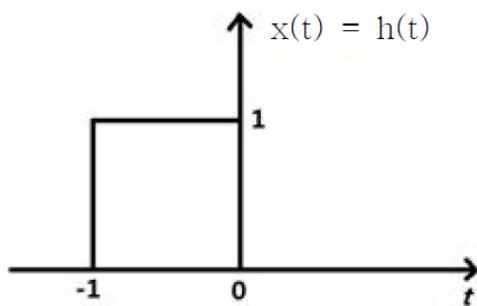


$$\therefore w(t) = 2x(t^2 - t_0) + 3 \text{ and } y(t - t_0) = 2x(t - t_0)^2 + 3 \rightarrow w(t) \neq y(t - t_0)$$

\therefore The system is Time-Varying

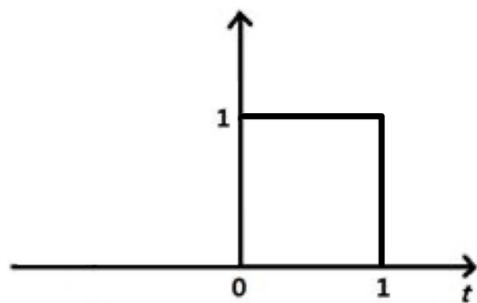
$\therefore y(t) = 2x(t^2) + 3$ is not LTI System

2. LTI System 의 입력 $x(t)$ 와 impulse response $h(t)$ 가 다음과 같이 주어졌을 때의 출력 $y(t)$ 를 구하시오.

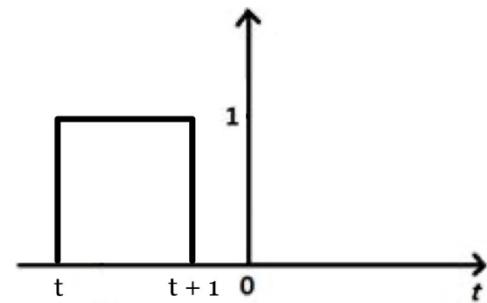


$$\because y(t) = \int_{-\infty}^{\infty} x(\tau)h(t - \tau)d\tau$$

· $h(-\tau)$



· $h(t - \tau)$



$$y(t) = \begin{cases} 0 & t \leq -2 (t + 1 \leq -1) \\ t + 2 & -2 \leq t < 1 (-1 \leq t + 1 < 0) \\ -t & -1 \leq t < 0 (0 \leq t + 1 < 1) \\ 0 & 0 \leq t (1 \leq t + 1) \end{cases}$$

