



$$\frac{d^2 y}{dt^2} + 6 \frac{dy}{dt} + 12y(t) = 10$$

$$\mathcal{L}\left[\frac{d^2 y(t)}{dt^2}\right] = s^2 Y(s)$$

$$\mathcal{L}\left[6 \frac{dy}{dt}\right] = 6sY(s)$$

$$\mathcal{L}[12y] = 12Y(s)$$

driving
Function

↓
V/P

$$\mathcal{L}[10(t)] = \frac{10}{s}$$

A

$$s^2 Y(s) + 6sY(s) + 12Y(s) = \frac{10}{s}$$

$$[s^2 + 6s + 12]Y(s) = \frac{10}{s}$$

$$Y(s) = \frac{10}{s[s^2 + 6s + 12]}$$

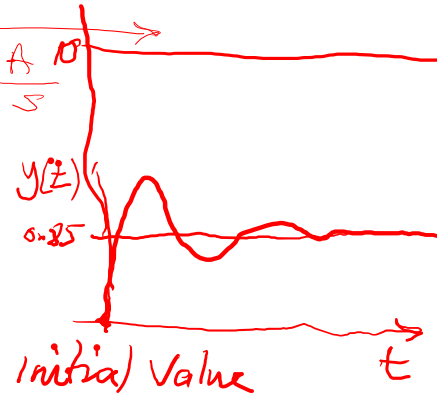
$$\textcircled{1} y(t=0)$$

$$y(0) = \lim_{s \rightarrow \infty} s \cdot \frac{10}{s(s^2 + 6s + 12)} = \frac{10}{\infty} = 0$$

$$\textcircled{2} y(t=\infty) = \lim_{s \rightarrow 0} s \cdot Y(s)$$

$$= \lim_{s \rightarrow 0} s \cdot \frac{10}{s(s^2 + 6s + 12)}$$

$$y(\infty) = \frac{10}{12} \approx 0.85 \text{ (steady state o/p) } y_{ss}$$



Initial Value
Theorem

$$x(t) = 10 \text{ ——— } \textcircled{1}$$

$$x(t) = \delta(t) \text{ impulse Function } \textcircled{2}$$

$$\mathcal{L}[10] = \frac{10}{s}$$

$$\mathcal{L}[\delta(t)] = 1$$

$$x(t) = e^{-3t} \text{ exponential Funct. } \textcircled{3}$$

$$\mathcal{L}[e^{-3t}] = \frac{1}{s+3}$$

$$x(t) = \cos(7t) \text{ } \textcircled{4}$$

$$\mathcal{L}[\cos(7t)] = \frac{s}{s^2 + 7^2}$$

$$f(t) = e^{-5t} + 3\cos(4t) + 3\delta(t)$$

$$F(s) = ?$$

$$\mathcal{L}[e^{-5t}] = \frac{1}{s+5}$$

$$\mathcal{L}[3\cos(4t)] = \frac{3s}{s^2 + \overset{16}{\underset{4}{4^2}}}$$

$$\mathcal{L}[3\delta(t)] = 3$$