Q5

Wednesday, October 25, 2023 6:28 AM

$$y''(t) + 0.5y'(t) + 0.15y(t) = x(t)$$

$$\mathcal{L}\{y''(t)\} + 0.5\mathcal{L}\{y'(t)\} + 0.15\mathcal{L}\{y(t)\} = \mathcal{L}\{u(t)\}$$

$$s^2Y(s) - s\,y(0) - y'(0) + 0.5\left(sY(s) - y(0)\right) + 0.15\,Y(s) = \frac{1}{s}$$

$$s^2Y(s) - s - 1 + 0.5sY(s) - 0.5 + 0.15Y(s) = \frac{1}{s}$$

$$Y(s)\left(s^2 + 0.5s + 0.15\right) - s - 1 - 0.5 = \frac{1}{s}$$

$$Y(s)\left(s^2 + 0.5s + 0.15\right) = \frac{1}{s} + s + 1.5$$

$$Y(s) = \frac{1 + s^2 + 1.5s}{s\left(s^2 + 0.5s + 0.15\right)}$$

Ans

When input is $x(t) = 2u(t)$

$$Y(s) = \left(\frac{2}{s} + s + 1.5\right) \Big/ \left(s^2 + 0.5s + 0.15\right)$$

$$Y(s) = \frac{2 + s^2 + 1.5s}{s\left(s^2 + 0.5s + 0.15\right)}$$

Ans