13/11/2023
Mon.
GROUP:C

$$Y(s) = \frac{s+1}{s^2+5s+6}$$

$$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = e^{-a}$$

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

$$\mathcal{L}\left[5\frac{dy}{dt}\right] = 5sY(s)$$

$$\mathcal{L}[6y] = 6Y(s)$$

$$[s^2+5s+6]Y(s) = 1$$

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

$$Y(s)[s^2+5s+6] = \frac{1}{s+a}$$

$$Y(s) = \frac{1}{(s+a)(s^2+5s+6)}$$

$$= \frac{1}{(s+a)(s+3)(s+2)}$$

$$\frac{-b \mp (b^2-4ac)}{2a}$$

$as^2+bs+c=0$
$a=1$
$b=5$
$c=6$

$$r_1, r_2 = \frac{-b \mp \sqrt{b^2-4ac}}{2a}$$

$$= \frac{-5 \mp \sqrt{25-4\times1\times6}}{2\times1}$$

$$= \frac{-5 \mp \sqrt{1}}{2}$$

$$Y(s) = \frac{1}{(s+a)(s+3)(s+2)}$$

$$Y(s) = \frac{A}{s+a} + \frac{B}{s+3} + \frac{C}{s+2}$$

$$\mathcal{L}^{-1}Y(s) = y(t)$$

$$y(t) = \mathcal{L}^{-1}\frac{A}{s+a} + \mathcal{L}^{-1}\frac{B}{s+3} + \mathcal{L}^{-1}\frac{C}{s+2}$$

$$= Ae^{-at} + Be^{-3t} + Ce^{-2t}$$

$$Y(s) = \frac{1}{(s+5)(s+3)(s+2)}$$

$$= \frac{A}{s+5} + \frac{B}{s+3} + \frac{C}{s+2}$$

$$= \frac{A(s+3)(s+2) + B(s+2)(s+5) + C(s+5)(s+3)}{(s+5)(s+3)(s+2)}$$

$$= \frac{As^2+5As+6A + Bs^2+7Bs+10B + Cs^2+8Cs+15C}{(s+5)(s+3)(s+2)}$$

$$6A+10B+15C = 1 \quad (1)$$

$$5A+7B+8C = 0 \quad (2)$$

$$A+B+C = 0 \quad (3)$$

$$\begin{bmatrix} 6 & 10 & 15 \\ 5 & 7 & 8 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

$$r_1 = \frac{-5+1}{2} = -2$$

$$r_2 = \frac{-5-1}{2} = -3$$

$$(s+3)(s+2)$$