



$$3A = 3 - C$$

$$3A = 3 - 13/4$$

$$A = -1/12$$

$$\frac{13/(s+2)}{(s+2)(s+2)(s+2)} = \frac{-1/12}{(s+2)} - \frac{1/3}{(s+2)^2} + \frac{13/4}{(s+2)^3}$$

$$\mathcal{L}^{-1}\{Y(s)\} = \mathcal{L}^{-1}\left\{\frac{-1/12}{(s+2)} - \frac{1/3}{(s+2)^2} + \frac{13/4}{(s+2)^3}\right\}$$

$$y = \frac{-1}{12} e^{-2t} - \frac{1}{3} t e^{-2t} + \frac{13}{12} e^{-2t}$$

$$y = \frac{1}{12} (e^{-2t} + 4t e^{-2t} - 13 e^{-2t})$$

$$\frac{dy}{dt} - 4y = 4 \text{ given that } t=0, y=2$$

$$\mathcal{L}\left\{\frac{dy}{dt}\right\} = sY(s) - y(0)$$

$$\mathcal{L}\{-4y\} = -4Y(s)$$

$$\mathcal{L}\{4\} = \frac{4}{s}$$

$$sY(s) - y(0) - 4Y(s) = \frac{4}{s}$$

$$sY(s) - 4Y(s) - y(0) = \frac{4}{s}$$

$$Y(s)(s-4) - 2 = \frac{4}{s} + 2$$

$$Y(s)(s-4) = \frac{4+2s}{s}$$

$$Y(s) = \frac{4+2s}{s(s-4)}$$

$$\frac{4+2s}{s(s-4)} = \frac{A}{s} + \frac{B}{s-4}$$

$$A+B=0$$

$$-6A - 3B + C = 2$$

$$6A + 3C = -3$$

$$B = -A \text{ from } \textcircled{1}$$

$$-6A + 3A + C = 2$$

$$-3A + C = 2 \text{ --- } \textcircled{2} * -3$$

$$8A - 3C = -5 \text{ --- } \textcircled{3} * 1$$

$$9A - 3C = -6$$

$$8A - 3C = -5$$

$$A = -1, B = 1$$

$$4+2s = As - 4A + B$$

$$A+B=2$$

$$-4A = 4$$

$$A = -2$$

$$B = 2+2, B = 4$$

$$\frac{4+2s}{s(s-4)} = \frac{-2}{s} + \frac{4}{s-4}$$

$$\mathcal{L}^{-1}\{Y(s)\} = \mathcal{L}^{-1}\left\{\frac{-2}{s} + \frac{4}{s-4}\right\}$$

$$y = -2 + 4e^{4t}$$

$$\textcircled{2} \frac{dy}{dt} - 2\frac{dy}{dt} + 5y = e^{2t}, \text{ given that } t=0, y=2$$

$$\mathcal{L}\left\{\frac{dy}{dt}\right\} = sY(s) - y(0)$$

$$\mathcal{L}\{-2\frac{dy}{dt}\} = -2sY(s) + 2y(0)$$

$$\mathcal{L}\{5y\} = 5Y(s)$$

$$\mathcal{L}\{e^{2t}\} = \frac{1}{s-2}$$

$$s^2Y(s) - 5Y(s) - y(0) - 2sY(s) + 2y(0) = \frac{1}{s-2}$$

$$s^2Y(s) - 2sY(s) + 5Y(s) - 2s - 1 + 4 = \frac{1}{s-2}$$

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

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

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

$$\frac{s-1}{(s-2)(s-4)} = \frac{-1/2}{s-2} + \frac{3/2}{s-4}$$

$$\frac{2s-5}{(s-3)(s^2-6s+8)} = \frac{-1}{(s-3)} + \left(\frac{-1/2}{(s-2)} + \frac{3/2}{(s-4)}\right)$$

$$\mathcal{L}^{-1}\{Y(s)\} = \mathcal{L}^{-1}\left\{\frac{-1}{(s-3)} - \frac{1/2}{(s-2)} + \frac{3/2}{(s-4)}\right\}$$

$$y = -e^{3t} - \frac{1}{2}e^{2t} + \frac{3}{2}e^{4t}$$

$$y = \frac{1}{2}(2e^{3t} + e^{2t} - 3e^{4t})$$

3) from ②

$$c = 2 - 3$$

$$c = -1$$

$$\frac{2s-5}{(s-3)(s^2-6s+9)} = \frac{-1}{(s-3)} + \frac{s-1}{(s^2-6s+9)}$$

$$\frac{2s-5}{(s-3)(s^2-6s+9)} = \frac{-1}{(s-3)} + \frac{s-1}{(s-2)(s-4)}$$

$$\frac{s-1}{(s-2)(s-4)} = \frac{A}{(s-2)} + \frac{B}{(s-4)}$$

$$s-1 = A(s-4) + B(s-2)$$

$$s-1 = As - 4A + Bs - 2B$$

$$A+B = 1 \quad \text{--- ①} \quad * -4$$

$$-4A - 2B = -1 \quad \text{--- ②} \quad * 1$$

$$-4A - 4B = -4$$

$$-4A - 2B = -1$$

$$-2B = -3$$

$$B = \frac{3}{2}$$

$$A = -\frac{1}{2}$$