

Soru: 1

$$y'' + 2y' - 4y = 3e^t \quad y(0) = 2, \quad y'(0) = 1$$

$$s^2 Y(s) - sy(0) - y'(0) - 2(sY(s) - y(0)) + (-4)Y(s) = \frac{3}{s-1}$$

$$s^2(Y(s)) - sy(0) - y'(0) - 2sY(s) - 2y(0) + (-4 \cdot Y(s)) = \frac{3}{s-1}$$

$$Y(s)(s^2 - 2s - 4) - 2s - 1 - 4 = \frac{3}{s-1}$$

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

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

$$Y(s) = \frac{2s^2 + 3s - 2}{(s-1)(s^2 - 2s - 4)} = \frac{A}{s-1} + \frac{Bs+C}{s^2 - 2s - 4}$$

$$2s^2 + 3s - 2 = As + 2As - 4A + Bs^2 + Cs - Bs - C$$

$$\left. \begin{array}{l} 2s^2 = (A+B)s^2 \\ 3s = 2As + Cs - Bs \\ -2 = -4A - C \end{array} \right\} \begin{array}{l} -2/A + B = 2 \\ -1/2A - B + C = 3 \\ 4A + C = 2 \end{array} \left\} \begin{array}{l} -2A - 2B = -4 \\ -2A + B - C = -3 \\ 4A + C = 2 \end{array} \right.$$

$$\Rightarrow B = 5, \quad A = -3, \quad C = 14$$

$$Y(s) = \frac{-3}{s-1} + \frac{5s+14}{s^2-2s-4} = \frac{-3}{s-1} + \frac{5s+14}{(s-1)^2-5}$$

$$= \frac{-3}{s-1} + \frac{5(s-1)}{(s^2-1)^2 - (\sqrt{5})^2} + \frac{19\sqrt{5}/\sqrt{5}}{(s^2-1)^2-5}$$

$$y(t) = -3e^t + e^t \cosh(\sqrt{5}t) + 3.8\sqrt{5}e^t \sinh(\sqrt{5}t)$$

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Soru: 2

$$y'' - 2y' - 3y = \sin 3 \quad y(0) = -2, \quad y'(0) = -2$$

$$s^2 Y(s) - sy(0) - y'(0) - 2sY(s) + 2y(0) - 3Y(s) = \frac{\sin 3}{s} = \frac{1}{20s}$$

$$Y(s)(s^2 - 2s - 3) + 2s + 2 - 4 = \frac{1}{20s}$$

$$Y(s)(s^2 - 2s - 3) = \frac{1}{20s} - 2s + 2 = \frac{-40s^2 + 40s + 1}{20s}$$

$$Y(s) = \frac{-40s^2 + 40s + 1}{20s(s^2 - 2s - 3)} = \frac{A}{20s} + \frac{B}{s-3} + \frac{C}{s+1}$$

$$-40s^2 + 40s + 1 = As^2 - 2As - 3A + 20Bs^2 + 20Bs + 20Cs^2 - 60Cs$$

$$\left. \begin{array}{l} A + 20B + 20C = -40 \\ 2A + 20B - 60C = 40 \\ -3A = 1 \end{array} \right\} A = -1/3, \quad B = -\frac{235}{240} \approx -1, \quad C = -\frac{241}{240} \approx -1$$

$$Y(s) = \frac{-1}{60s} - \frac{1}{s-3} - \frac{1}{s+1}$$

$$y(t) = -\sin 1 - e^{3t} - e^{-t}$$

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Soru: 6:

$$H(z) = \frac{1 - 2z^{-2}}{\frac{1}{2}z^{-2} + z^{-1} + 1}$$

$$= \frac{2z^2 - 4}{2z^2 + z + 1}$$

$$\begin{array}{r|l} 2z^2 - 4 & 2z^2 + z + 1 \\ \hline 2z^2 + z + 1 & 1 - \frac{1}{2}z^{-1} - \frac{9}{4}z^{-2} \\ \hline -z - \frac{10}{2} & \\ -z - \frac{1}{2} - \frac{1}{2}z^1 & \\ \hline -\frac{9}{2} + \frac{1}{2}z^{-1} & \\ -\frac{9}{2} - \frac{9}{4}z^{-1} - \frac{9}{4}z^{-2} & \\ \hline \end{array}$$

$$h(t) = \delta(n) - 0,5\delta(n-1) - 2,25\delta(n-2)$$