

Assignment 1

$$\frac{d^3 y}{dt^3} + 3\frac{d^2 y}{dt^2} + 5\frac{dy}{dt} + y = \frac{d^3 x}{dt^3} + 4\frac{d^2 x}{dt^2} + 6\frac{dx}{dt} + 8x$$

Laplace

$$\hookrightarrow s^3 y(s) + 3s^2 y(s) + 5s y(s) + 1 = s^3 x(s) + 4s^2 x(s) + 6s x(s) + 8$$

$$y(s) [s^3 + 3s^2 + 5s + 1] = [s^3 + 4s^2 + 6s + 8] x(s)$$

$$\frac{y(s)}{x(s)} = \frac{s^3 + 4s^2 + 6s + 8}{s^3 + 3s^2 + 5s + 1}$$

Assignment 2

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

$$\frac{A}{s} + \frac{B}{s+1} + \frac{C}{s+3}$$

$$A = \left[\frac{2e^{-6s}}{(s+1)(s+3)} \right]_{s=0} = \frac{2}{3}$$

$$= \frac{2}{3} - \frac{e^6}{s+1} + \frac{e^{18}}{3(s+3)}$$

$$B = \left[\frac{2e^{-6s}}{s(s+3)} \right]_{s=-1} = \frac{2e^6}{-2} = -e^6$$

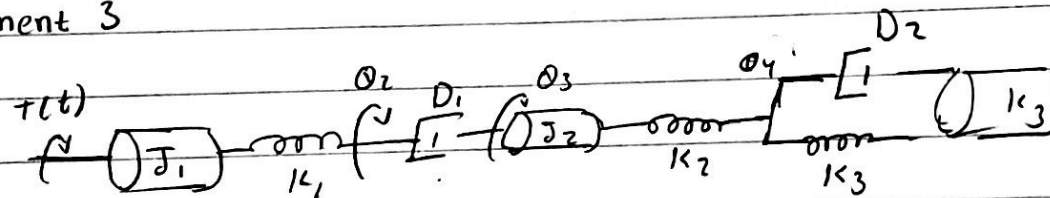
$$F(t) = \frac{2}{3} - e^6 e^{-t} + \frac{e^{18}}{3} e^{-3t}$$

$$F(\rho) = \frac{2}{3} - e^6 e^{-\rho} + \frac{e^{18}}{3} e^{-3(\rho)}$$

$$C = \left[\frac{2e^{-6s}}{s(s+1)} \right]_{s=-3} = \frac{2e^{18}}{6} = \frac{e^{18}}{3}$$

$$F(\rho) = \boxed{\frac{2}{3}}$$

Assignment 3



$$(J_1 s^2 + K_1) \theta_1(s) - K_1 \theta_2(s) = T(s) \quad \text{①}$$

$$-K_1 \theta_1(s) + (D_1 s + K_1) \theta_2(s) - D_1 s \theta_3(s) = 0 \quad \text{②}$$

$$-D_1 s \theta_2(s) + (J_2 s^2 + D_1 s + K_2) \theta_3(s) - K_2 \theta_4(s) = 0 \quad \text{③}$$

$$-K_2 \theta_3(s) + (D_2 s + K_2 + K_3) \theta_4(s) = 0 \quad \text{④}$$