

Answers to ES205 Exam 1, 1998

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

$$1b) \begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{Bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & 0 & -3 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} + \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 5 \end{bmatrix} \begin{Bmatrix} 0 \\ 0 \\ f(t) \end{Bmatrix}$$

$$1c) \frac{1}{4} \ddot{x} + 0.2\dot{x} + x = 20 \sin 3t$$

$$1d) \omega_n = 480 \text{ rad/s}$$

$$1e) T = 1 \text{ ft-lbf}$$

$$1f) e_b = 5.65 \text{ v}$$

$$1g) z_{eq} = \frac{RCLs^2 + Ls}{CLs^2 + RCs + 1}$$

$$2a) \frac{V_o}{V_s} = \frac{1}{R^2 C_1 C_2 s^2 + 2C_2 R s + 1}$$

$$2b) \omega_n = \sqrt{\frac{1}{R^2 C_1 C_2}}$$

3) I got 8 equations 8 unknowns.