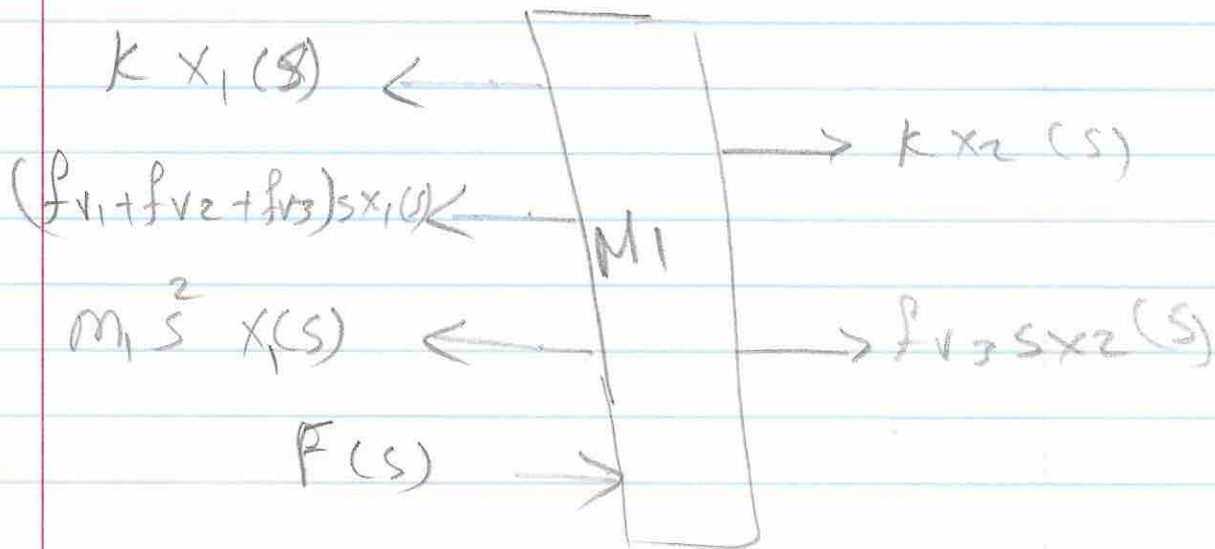
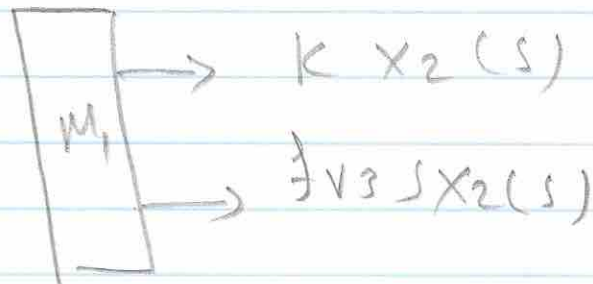
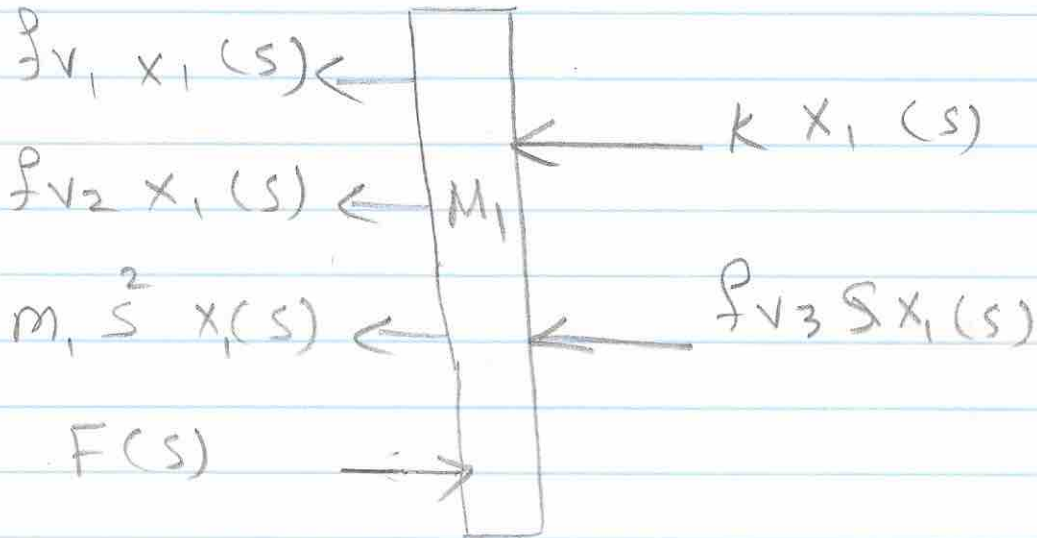
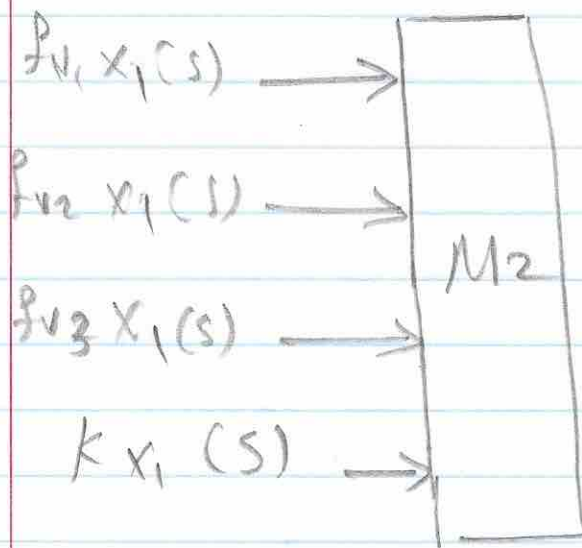
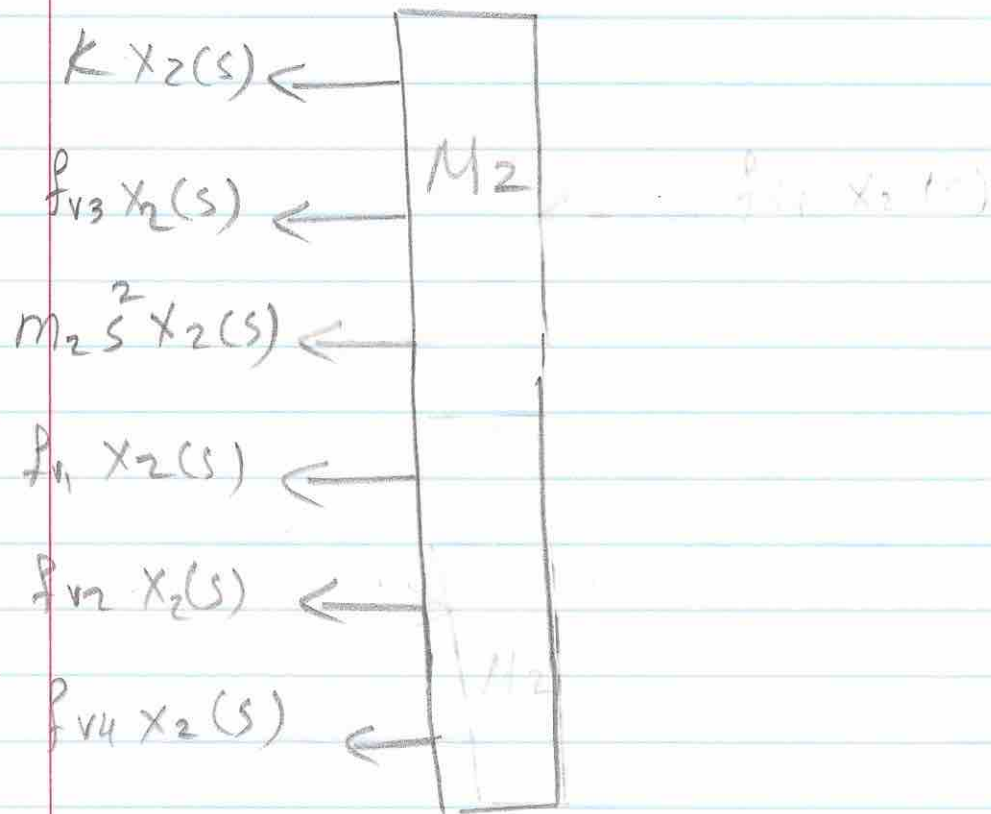


①

Free Body diagram.



(2)



3

$$X_1(s) \left[K + s(\cancel{f_{v1}} + \cancel{f_{v2}} + \cancel{f_{v2}}) + m s^2 \right]$$

$$- X_2(s) \left[K + s \cancel{f_{v3}} \right] = F(s)$$

$$X_1(s) \left[1 + 3s + s^2 \right] - X_2(s) \left[1 + 3s \right] = F(s)$$

(4)

$$X_2(s) \left[1 + s(f_{v1} + f_{v2} + f_{v3} + f_{v4}) + m_2 s^2 \right] - X_1(s) \left[s(f_{v1} + f_{v2} + f_{v3}) + 1 \right] = 0$$

$$X_2(s) \left[1 + 4s + s^2 \right] - X_1(s) \left[3s + 1 \right] = 0$$

$$G(s) = \frac{X_2(s)}{F(s)}$$

$$\begin{bmatrix} s^2 + 3s + 1 & -3s + 1 \\ -3s + 1 & s^2 + 4s + 1 \end{bmatrix} \begin{bmatrix} X_1(s) \\ X_2(s) \end{bmatrix} = \begin{bmatrix} F(s) \\ 0 \end{bmatrix}$$

$$X_2(s) = \frac{\begin{vmatrix} s^2 + 3s + 1 & F(s) \\ -3s + 1 & 0 \end{vmatrix}}{(s^2 + 3s + 1)(s^2 + 4s + 1) - (3s + 1)(3s + 1)}$$

5

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

$$3s+1$$

$$s^4 + 4s^3 + s^2 + 3s^3 + 12s^2 + 3s + 2s^2 + 4s + 1 - (9s^2 + 1 + 6s)$$

$$\frac{X_2(s)}{F(s)} = \frac{3s+1}{s^4 + 7s^3 + 5s^2 + s}$$