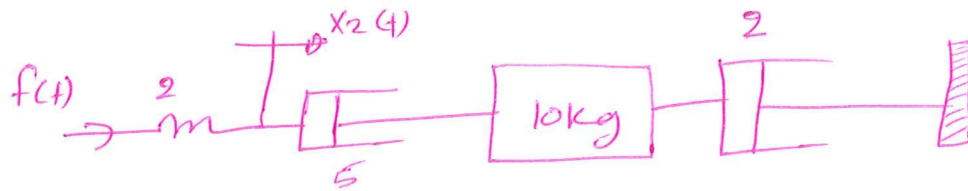


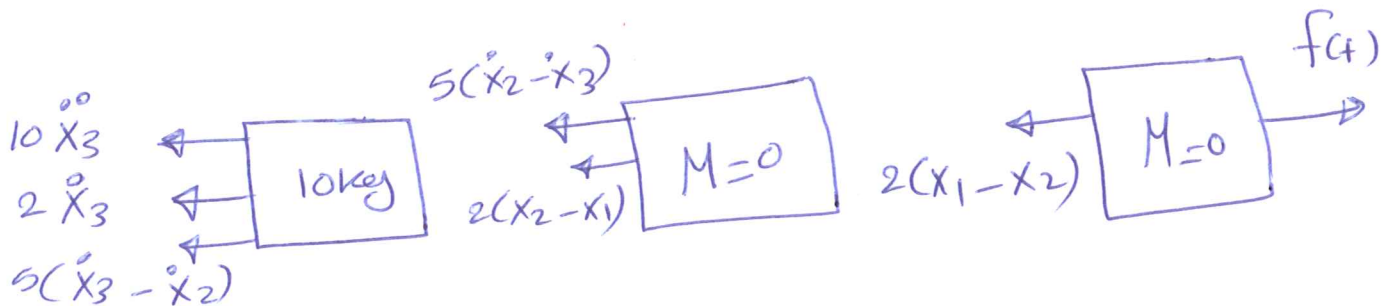
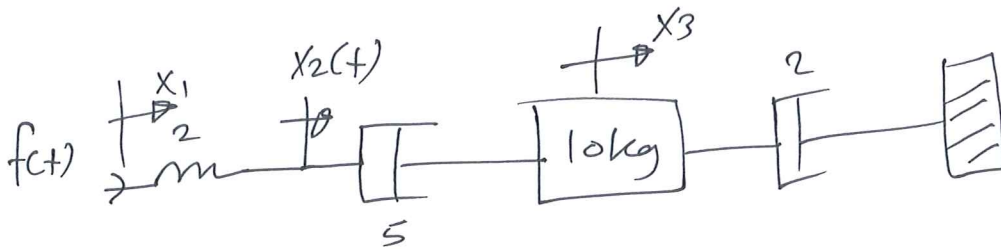
# Homework # 2 solution.

25)



Find  $X_2 / F$

نلاحظ في السؤال وجود عقاوول (نقل) لا يوجد على انزاحة لذلك ففرضنا  
وجود انزاحة، ايضا عند القوة الاساسية لدرجة انزاحة، كذلك  
نلاحظ انه يقوى عند الانزاحة  $x_2$  تساوي مجموع يقوى على كتلة  $x_2$



$$2(x_1 - x_2) = f(t)$$

$$2x_1 - 2x_2 = f(s) \quad (1)$$

$$5(\dot{x}_2 - \dot{x}_3) + 2(x_2 - x_1) = 0$$

$$5s\dot{x}_2 - 5s\dot{x}_3 + 2x_2 - 2x_1 = 0$$

$$(5s + 2)x_2 - 5s\dot{x}_3 - 2x_1 = 0 \quad (2)$$

$$10 \ddot{x}_3 + 2 \ddot{x}_3 + 5(\ddot{x}_3 - \ddot{x}_2) = 0$$

$$(10s^2 + 2s + 5s)x_3 - 5sx_2 = 0$$

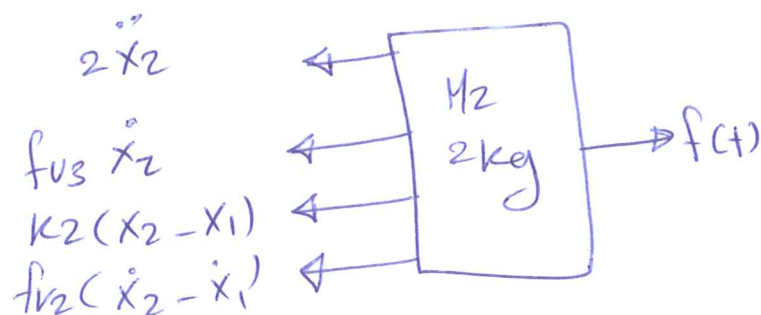
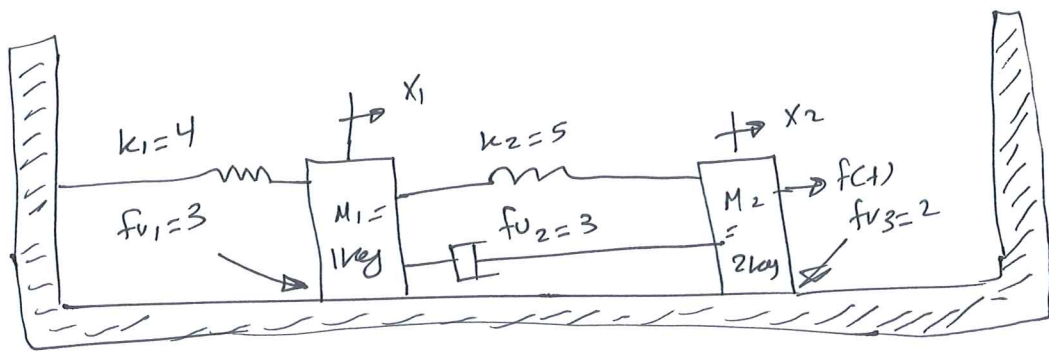
$$\boxed{(10s^2 + 7s)x_3 - 5sx_2 = 0} \rightarrow \textcircled{3}$$

$$x_2 = \frac{\det A_2}{\det A} = \frac{\begin{vmatrix} 0 & 0 & 10s^2 + 7s \\ -2 & 0 & -5s \\ 2 & f & 0 \end{vmatrix}}{\begin{vmatrix} 0 & -5s & 10s^2 + 7s \\ -2 & 2 + 5s & -5s \\ 2 & -2 & 0 \end{vmatrix}} =$$

$$\begin{aligned} x_2 &= \frac{(10s^2 + 7s)(-2f)}{5s(10s) + (10s^2 + 7s)(4 - 2(2 + 5s))} \\ &= \frac{-2(10s^2 + 7s)f}{50s^2 + -100s^3 - 70s^2} \\ &= \frac{(10s^2 + 7s)f}{50s^3 + 10s^2} = \frac{(10s + 7)f}{50s^2 + 10s} \\ &= \frac{(10s + 7)f}{10s(s + 1)} \end{aligned}$$

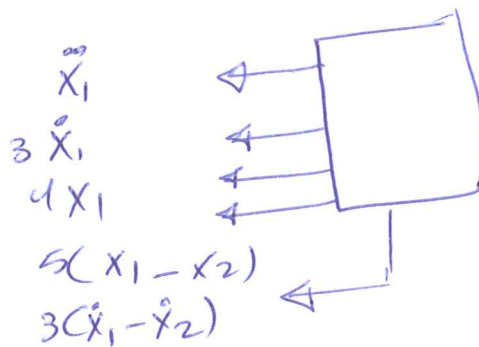
$$\frac{x_2}{f} = \frac{(10s + 7)}{10s(s + 1)}$$

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$$2\ddot{x}_2 + 2\dot{x}_2 + 5(x_2 - x_1) + 3(\dot{x}_2 - \dot{x}_1) = f$$

$$(2s^2 + 3s + 5)x_2 - (3s + 5)x_1 = f \rightarrow \textcircled{1}$$



$$\ddot{x}_1 + 3\dot{x}_1 + 4x_1 + 5(x_1 - x_2) + 3(\dot{x}_1 - \dot{x}_2) = 0$$

$$(s^2 + 6s + 9)x_1 - (3s + 5)x_2 = 0 \rightarrow \textcircled{2}$$

$$x_1 = \begin{vmatrix} f & 2s^2 + 2s + 5 \\ 0 & -(3s + 5) \end{vmatrix}$$


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$$\begin{vmatrix} -(3s + 5) & (2s^2 + 2s + 5) \\ (s^2 + 6s + 9) & -(3s + 5) \end{vmatrix}$$

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

$\downarrow$   
 $9s^2 + 30s + 25$

$\downarrow$   
 $2s^4 + 12s^3 + 18s^2 + 5s^3 + 30s^2 + 45s + 5s^2 + 30s + 45$

$$= \frac{+f(3s + 5)}{2s^4 + 17s^3 + 44s^2 + 45s + 20}$$