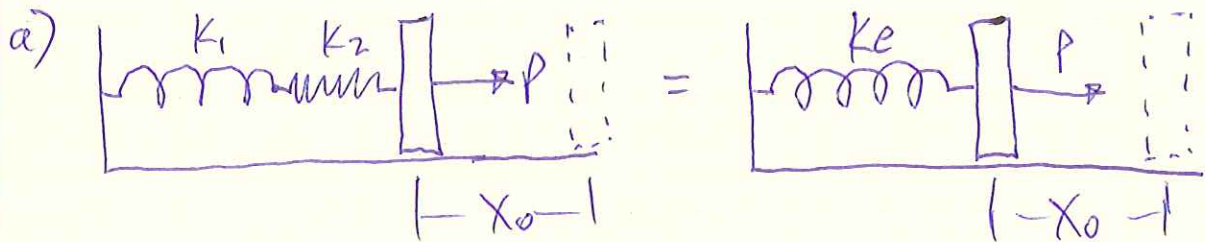
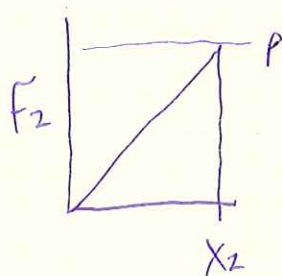
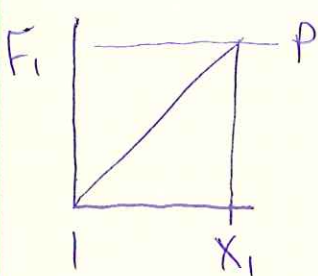


PROB. 13-55

FIND EQUIVALENT SPRING CONSTANT



FOR DUAL SPRING, FORCE IN EACH SPRING IS P :



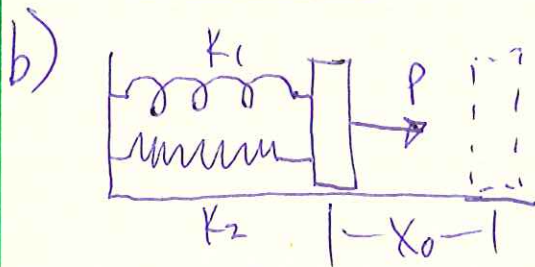
$$P = k_1 X_1 \Rightarrow X_1 = \frac{P}{k_1}$$

$$P = k_2 X_2 \Rightarrow X_2 = \frac{P}{k_2}$$

$$X_1 + X_2 = X_0 : \quad \frac{P}{k_1} + \frac{P}{k_2} = \frac{P}{k_e}$$

$$\frac{1}{k_e} = \frac{1}{k_1} + \frac{1}{k_2} = \frac{k_2 + k_1}{k_1 k_2}$$

$$k_e = \frac{k_1 \cdot k_2}{k_1 + k_2}$$



FOR DUAL SPRING, THE ELONGATION OF EACH SPRING IS X_0 :

$$F_1 = k_1 X_0, \quad F_2 = k_2 X_0, \quad F_1 + F_2 = P = k_e X_0$$

$$k_1 X_0 + k_2 X_0 = k_e X_0 \Rightarrow \boxed{k_e = k_1 + k_2}$$