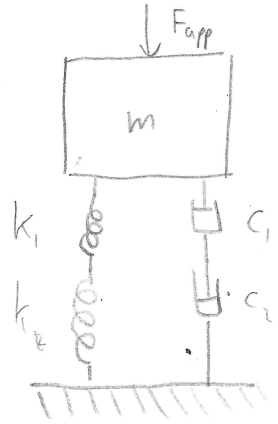
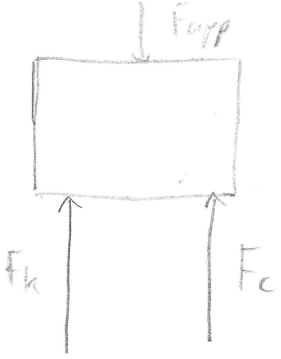
20-R-VIB-DY-39 Intermediate

A mass, m = 25 kg, is supported by two springs in series and two dampers in series. The dampers each have a damping constant c = 100 Ns/m and the springs each have a spring constant k = 100 N/m. If a force f = 15 cos 2t is applied to the mass, determine an equivalent electrical analog system to the damped forced system.



Solution FBD:



$$\Sigma F_y = -ma$$

$$ky + c\dot{y} - F_{app} = -m\ddot{y}$$

$$m\ddot{y} + c\dot{y} + ky = F_{app}$$

$$k = \frac{k_1 k_2}{k_1 + k_2} = 50 \text{ N/m}$$

$$c = \frac{c_1 c_2}{c_1 + c_2} = 50 \text{ Ns/m}$$

$$m = L = 25 \text{ H}$$

$$c = R = 50 \Omega$$

$$k = \frac{1}{C} \quad C = 0.02 \text{ F}$$

$$F(t) = E(t) = 15 \cos 2t$$