EM 633

H.W #2

2-1. The weight W of the building of Fig. E2-1 is 200 *kips* and the building is set into free vibration by releasing it (at time $t = 0$) from a displacement of 1.20 *in*. If the maximum displacement on the return swing is 0.86 *in* at time $t = 0.64$ *sec*, determine:

(*a*) the lateral spring stiffness k

(*b*) the damping ratio ξ

(*c*) the damping coefficient c

2-2. Assume that the mass and stiffness of the structure of Fig. 2-1*a* are as follows: $m = 2\ kips \cdot sec^2/in$, $k = 40\ kips/in$. If the system is set into free vibration with the initial conditions $v(0) = 0.7\ in$ and $\dot{v}(0) = 5.6\ in/sec$, determine the displacement and velocity at $t = 1.0\ sec$, assuming:

(*a*) $c = 0$ (undamped system)

(*b*) $c = 2.8\ kips \cdot sec/in$

2-3. Assume that the mass and stiffness of the system of Fig. 2-1*a* are $m = 5\ kips \cdot sec^2/in$ and $k = 20\ kips/in$, and that it is undamped. If the initial displacement is $v(0) = 1.8\ in$, and the displacement at $t = 1.2\ sec$ is also 1.8 *in*, determine:

(*a*) the displacement at $t = 2.4\ sec$

(*b*) the amplitude of free vibration ρ

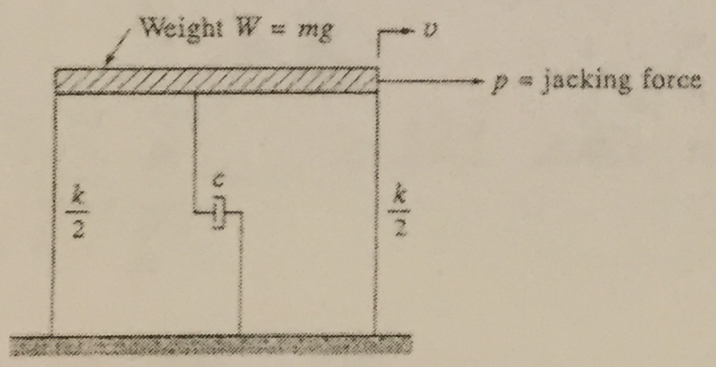

FIGURE E2-1
Vibration test of a simple building.

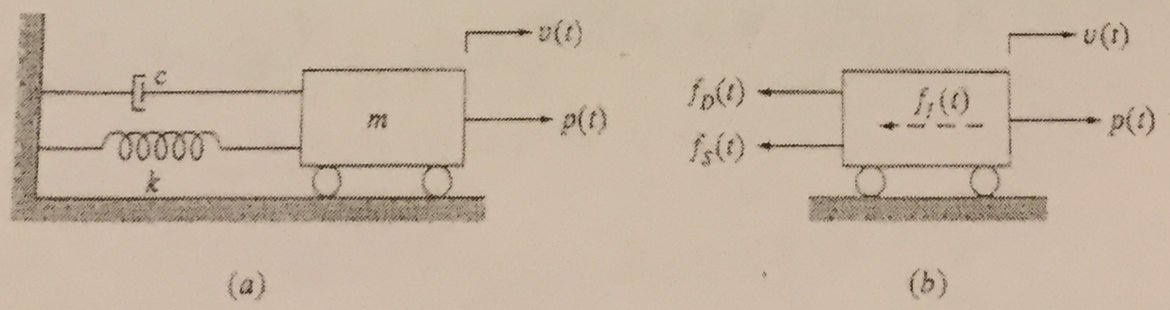

FIGURE 2-1
Idealized SDOF system: (*a*) basic components; (*b*) forces in equilibrium.