**CE 225: Dynamic of Structures** **Fall 2025**

# Discussion 7: Midterm Review Problems

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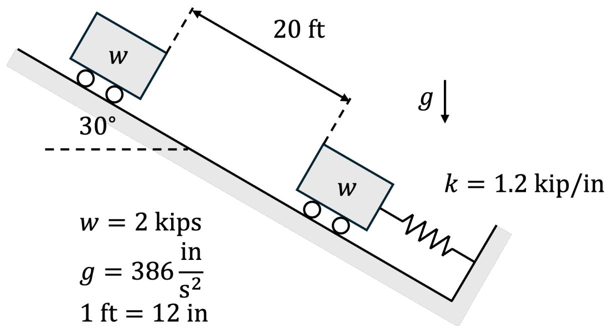
## Problem 1




A cart with weight $w = 2$ kips is dropped from rest in the position shown in the Figure above. The block slides on the tilted surface, and collides with another block, initially at rest, with weight $w = 2$ kips, which is attached to a spring of stiffness $k = 1.2$ kips/in.

a) Write the equation of motion for the system after the blocks collide. Assume the blocks stick together after motion.

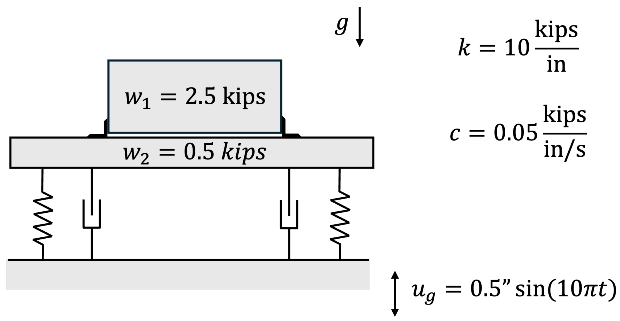
b) For the EOM in the previous part, determine the initial conditions and solve the motion of the system.

c) Will upper block will bounce back, detaching from the lower block?

Problem 1

Problem 1

# Problem 2



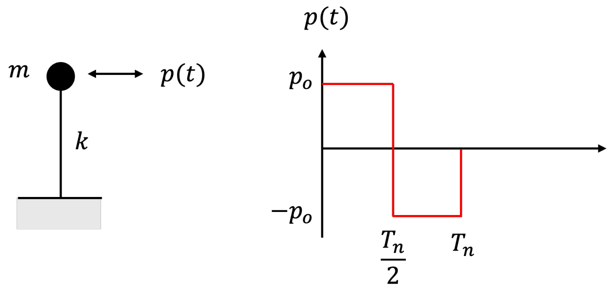

The system shown in the Figure is a platform of weight $w_2 = 0.5$ kips, which supports a block of weight $w_1 = 2.5$ kips. The platform rests on a set of springs and dashpots, which in sum they have the properties shown in the Figure. The system is subjected to a harmonic motion characterized by $u_g = 0.5 \sin(10\pi t)$ inches.

a) Determine the natural vibration frequency $\omega_n$ and the damping ratio $\zeta$.

b) What is the maximum tensile force in the attachments between the two blocks?

Problem 2

# Problem 3




The SDOF system shown above is subjected to the forcing function shown, which is a combination of two rectangular pulses. Determine the maximum amplitude of the motion of the system.

# Problem 4

a) Repeat Part b of Problem 2, but now the ground shaking is characterized by the design spectrum shown below, scaled to a PGA of 0.5g.

b) How would you solve if the springs and dashpots were replaced by an elastoplastic spring with allowed ductility $\mu = 4$?

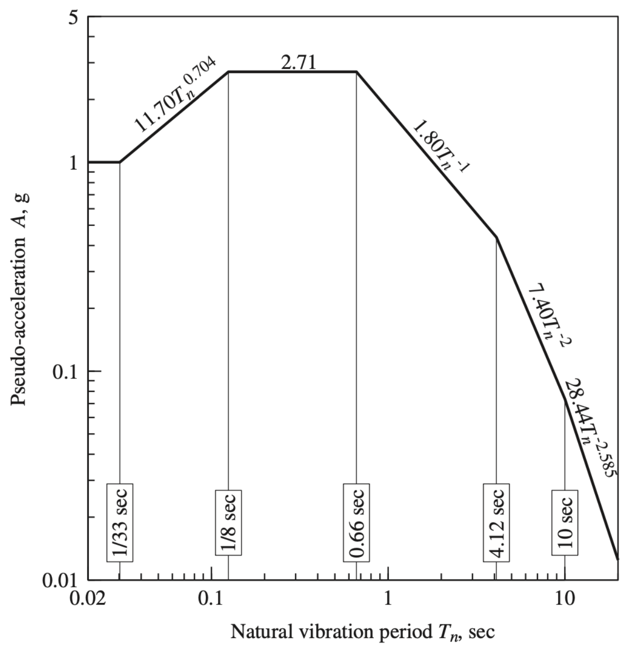



**Figure 6.9.5** Elastic pseudo-acceleration design spectrum (84.1th percentile) for ground motions with $\ddot{u}_{go} = 1\text{g}$, $\dot{u}_{go} = 48$ in./sec, and $u_{go} = 36$ in.; $\zeta = 5\%$.