

Practice Problem Set 8

March 12, 2017

Problem 1

A 250g mass is mounted on a spring with a spring constant of $k = 3.3 \text{ N/m}$. The damping constant for this system is $b = 8.4 \times 10^{-3} \text{ kg/s}$. Is the system underdamped, critically damped, or overdamped? How many oscillations will the system undergo during the time it takes the amplitude to decay to $1/e$ of its original value?

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Problem 2

A block with mass M rests on a frictionless surface inclined 30° and is connected to a horizontal spring of force constant k . The other end of the spring is attached to a wall. A second block with mass m rests on top of the first block. The coefficient of static friction between the blocks is μ_s . Find the maximum amplitude of the oscillation such that the top block will not slip on the bottom block.

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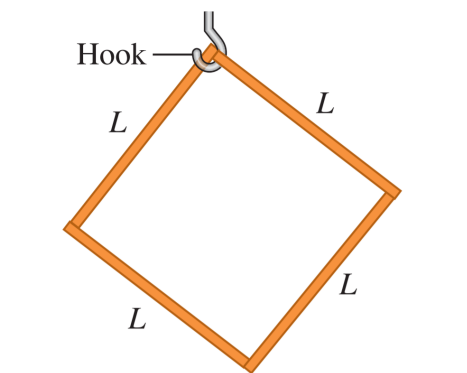
Problem 3

A steel beam of mass M and length L is suspended at its midpoint by a cable and executes torsional oscillations. If two masses m are now attached to either end of the beam and this reduces the frequency by 10% what is the ratio m/M ?

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Problem 4

A square object of mass m is constructed of four identical uniform thin sticks, each of length L , attached together. This object is hung on a hook at its upper corner. If it is rotated slightly to the left and then released, at what frequency will it swing back and forth?



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