

ME 460/660 Exam 1, Spring '95

- 1) An unknown mass (m kg) is attached to an unknown spring (k N/m). The system has a natural frequency of 5 rad/sec. After a 1 kg mass is added, the natural frequency is identified to be 4 rad/sec. Determine the unknown mass m and stiffness k .
- 2) A single degree of freedom (SDOF) system with a mass of 2 kg, a stiffness of 10 N/m, and a damping factor of 1 kg-s has initial conditions $x_0=0$ m, and $\dot{x}_0=.01$ m. Find the natural frequency, damping ratio, damped natural frequency, and the free response.
- 3) Derive the equation of motion for the following system.

Figure Not Available (Lost)

- 4) Design the suspension system for an 1000 kg automobile (choose the stiffness and damping value) subject to the following constraints: four wheels (four identical springs/dashpots), a maximum additional static displacement of 1 cm for each additional 80 kg passenger entering the car, and a displacement transmissibility of less than 2.