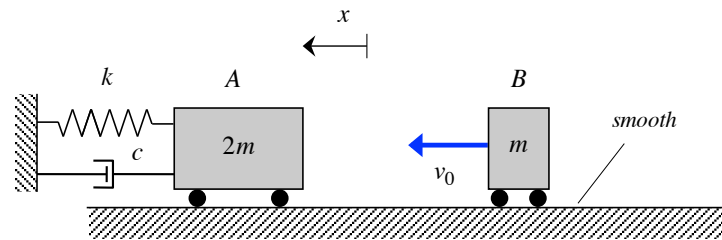


**Homework H.6.H**

**Given:** Particle A (having a mass of  $2m$ ) is attached to a grounded spring of stiffness  $k$  and a dashpot with a damping coefficient  $c$ . Let  $x$  represent the motion of A, with  $x = 0$  when the spring is unstretched. At an instant when A is at rest and with the spring being unstretched/uncompressed (that is, when  $x = 0$ ), particle B (of mass  $m$ ), traveling with a speed of  $v_0$ , strikes A. On the impact with A, block B immediately sticks to block A.

**Find:** For this problem:

- Determine the speed of A immediately after B sticks to it.
- Derive the dynamical equation of motion (EOM) of A+B in terms of the coordinate  $x$  describing the motion after the two blocks stick together;
- Determine the undamped natural frequency  $\omega_n$ , the damping ratio  $\zeta$  and the damped natural frequency  $\omega_d$  for the system;
- Determine the response  $x(t)$  of the system after A and B stick together.



Use the following parameters in your analysis:  $m = 10$  kg,  $k = 3000$  N/m and  $c = 360$  kg/s.