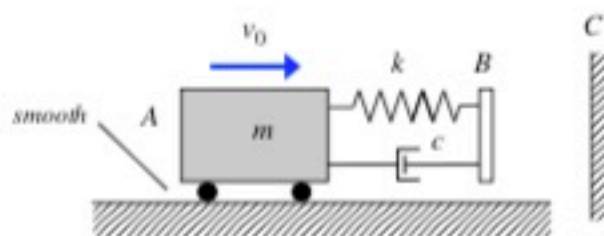


## Section 6.B - bonus question #2

**Given:** A block of mass  $m$  is attached to a spring of stiffness  $k$  and a dashpot with a damping coefficient  $c$ , with the opposite ends of the spring and dashpot joined to connector B, where the mass of B can be considered to be negligible. A is initially traveling to the right with a speed of  $v_0$  when it strikes a stationary wall at C. B immediately sticks to C after impact. Let  $x$  represent the motion of A after B has stuck to the wall, with  $x$  being measured positively to the right.

**Find:** For this problem:

- Derive the dynamical equation of motion (EOM) of the system in terms of the coordinate  $x$  for motion occurring after B sticks to C;
- Determine the undamped natural frequency  $\omega_n$ , the damping ratio  $\zeta$  and the damped natural frequency  $\omega_d$  for the system; and,
- Determine the maximum compression of the spring after B impacts and sticks to C.



Use the following parameters in your analysis:  $v_0 = 5$  m/s,  $m = 10$  kg,  $k = 4000$  N/m and  $c = 240$  kg/s.