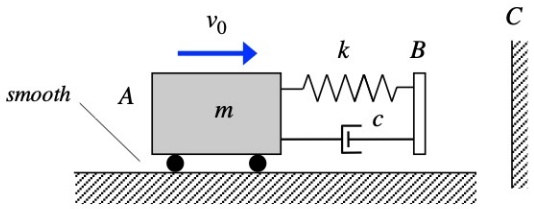
Homework H.6.H

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:
(a) Derive the dynamical equation of motion (EOM) of the system in terms of the coordinate x for motion occuring after B sticks to C;
(b) Determine the undamped natural frequency ω_n, the damping ratio ζ and the damped natural frequency ω_d for the system; and,
(c) 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.