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1 % Sounak Ghosh
2 % 9/17/19
3 % ECE 202 - Fall 2019 - MATLAB Exercise M2 - Design Problem
4 % Equation source: http://www.convertalot.com/elastic\_collision\_calculator.html
5 % MATLAB script to determine the mass of a cart.
6
7
8 clear % clears all variables in the workplace; avoids common errors
9 clc % clears all previous outputs in the command window
10
11 % ----- given information -----
12
13 m2 = 150; % mass of the cart#2 in g
14 v1i = 30; % initial velocity of cart#1 in cm/s
15 v2i = -30; % initial velocity of cart#2 in cm/s
16 v1f = 0; % final velocity of cart#1 in cm/s
17
18 % ----- calculations -----
19 % (c)
20
21 m1 = m2*(v1f + v1i - 2*v2i) / (v1i - v1f) % Mass of cart#1 in g using v1f
22 % from M1 that uses
23 % momentum conservation
24 % and kinetic energy
25 % conservation
26
27 M = m1 + m2; % total mass of cart#1 and cart#2 in g
28
29 v2f = (m1*(2*v1i - v2i) + m2*v2i) / M % final velocity of cart#2 in cm/s
30 % using momentum conservation
31 % and kinetic energy
32 % conservation
33
34
35 % ----- check answers -----
36 % (e)
37 p1i = m1*v1i; % Initial Momentum Cart#1
38 p2i = m2*v2i; % Initial Momentum Cart#2
39 p1f = m1*v1f; % Final Momentum Cart#1
40 p2f = m2*v2f; % Final Momentum Cart#2
41
42 check_p = p1f + p2f - (p1i + p2i) % The change in the total
43 % momentum of the system
44 % before & after the
45 % collision should be
46 % zero.
47
48 eli = 0.5*m1*v1i^2; % Initial Energy Cart#1
49 e2i = 0.5*m2*v2i^2; % Initial Energy Cart#2
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50 elf = 0.5*m1*v1f^2;    % Final Energy Car1#1
51 e2f = 0.5*m2*v2f^2;    % Final Energy Car1#2
52
53 check_Energy = elf + e2f - (eli + e2i)
54                                     % The change in the total
55                                     % energy of the system
56                                     % before & after the
57                                     % collision should be
58                                     % zero.
59
60
61 % (f)
62 v1f = (m1*v1i - m2*(v1i - 2*v2i))/ M    % final velocity of cart#1 in cm/s
63                                     % should be zero as the cart#1
64                                     % is stopping after collision.
65 % The design criterion is met as we can see that the velocity of cart#1
66 % after the collision is zero. Based on the equation of final velocity of
67 % cart#1 from M1.
68
69
70
71
72
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