

AERO/MECH 201

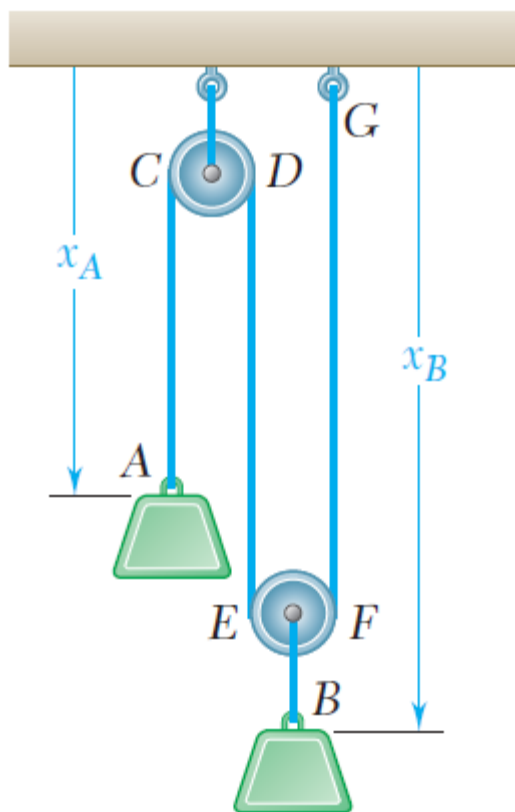
Engineering Dynamics Lecture 4

Feb 10th 2013

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KUSTAR

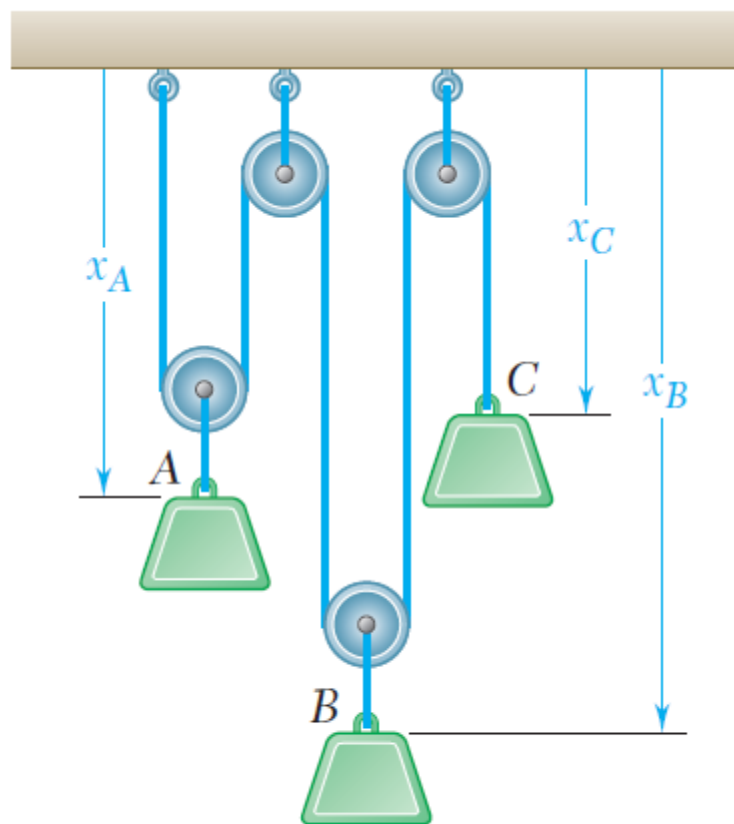
Dependent Motions



$$x_A + 2x_B = \text{constant}$$

Fig. 11.8

$$\Delta x_B = -\frac{1}{2}\Delta x_A$$

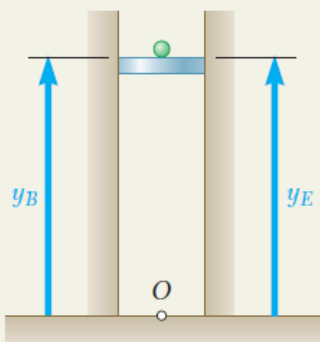
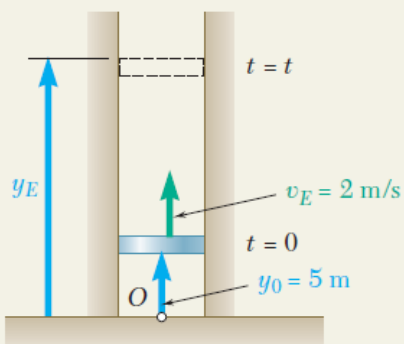
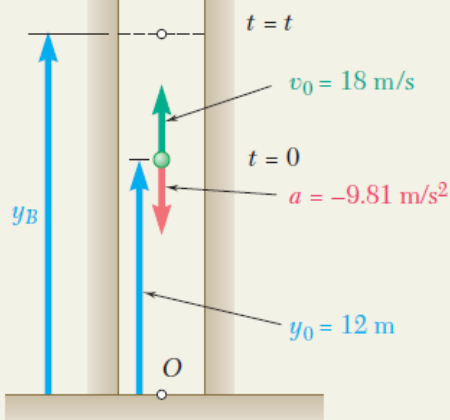


$$2x_A + 2x_B + x_C = \text{constant}$$

Fig. 11.9

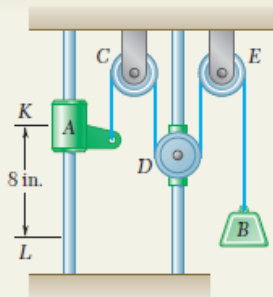
$$2 \frac{dx_A}{dt} + 2 \frac{dx_B}{dt} + \frac{dx_C}{dt} = 0 \quad \text{or} \quad 2v_A + 2v_B + v_C = 0$$

$$2 \frac{dv_A}{dt} + 2 \frac{dv_B}{dt} + \frac{dv_C}{dt} = 0 \quad \text{or} \quad 2a_A + 2a_B + a_C = 0$$



SAMPLE PROBLEM 11.4

A ball is thrown vertically upward from the 12-m level in an elevator shaft with an initial velocity of 18 m/s. At the same instant an open-platform elevator passes the 5-m level, moving upward with a constant velocity of 2 m/s. Determine (a) when and where the ball will hit the elevator, (b) the relative velocity of the ball with respect to the elevator when the ball hits the elevator.



SAMPLE PROBLEM 11.5

Collar A and block B are connected by a cable passing over three pulleys C , D , and E as shown. Pulleys C and E are fixed, while D is attached to a collar which is pulled downward with a constant velocity of 3 in./s. At $t = 0$, collar A starts moving downward from position K with a constant acceleration and no initial velocity. Knowing that the velocity of collar A is 12 in./s as it passes through point L , determine the change in elevation, the velocity, and the acceleration of block B when collar A passes through L .

