동역학 446.204A 002

과제 # 1

배부일: 9월 10일
제출 기한: 9월 19일

1.

11.11 The acceleration of a particle is defined by the relation $a = A - 6t^2$, where A is a constant. At $t = 0$, the particle starts at $x = 8$ m with $v = 0$. Knowing that at $t = 1$ s, $v = 30$ m/s, determine (a) the times at which the velocity is zero, (b) the total distance traveled by the particle when $t = 5$ s.

2.

11.24 At $t = 0$, a particle starts from $x = 0$ with a velocity v_0 and an acceleration defined by the relation $a = -5/(2v_0 - v)$, where a and v are expressed in m/s^2 and m/s, respectively. Knowing that $v = 0.5v_0$ at $t = 2$ s, determine (a) the initial velocity of the particle, (b) the time required for the particle to come to rest, (c) the position where the velocity is 1 m/s.

3.

11.35 A group of students launches a model rocket in the vertical direction. Based on tracking data, they determine that the altitude of the rocket was 27.3 m at the end of the powered portion of the flight and that the rocket landed 16 s later. Knowing that the descent parachute failed to deploy so that the rocket fell freely to the ground after reaching its maximum altitude and assuming that $g = 9.81$ m/s^2, determine (a) the speed v_1 of the rocket at the end of powered flight, (b) the maximum altitude reached by the rocket.

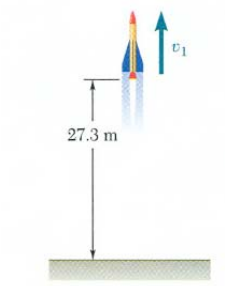

Fig. P11.35

4.

11.57 Collar A starts from rest at $t = 0$ and moves downward with a constant acceleration of 7 mm/s^2. Collar B moves upward with a constant acceleration, and its initial velocity is 8 mm/s. Knowing that collar B moves through 20 mm between $t = 0$ and $t = 2$ s, determine (a) the accelerations of collar B and block C, (b) the time at which the velocity of block C is zero, (c) the distance through which block C will have moved at that time.

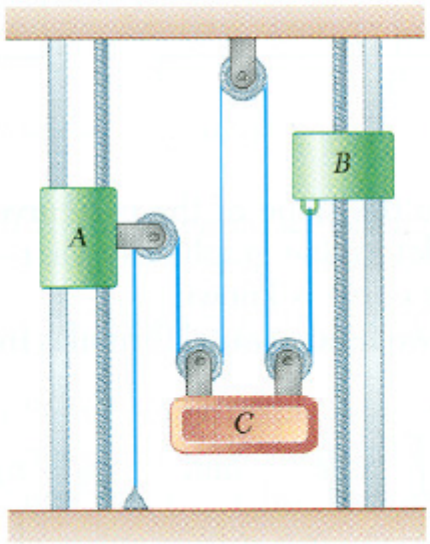

Fig. P11.57 and P11.58

5.

11.58 Collars A and B start from rest, and collar A moves upward with an acceleration of $3t^2$ mm/s^2. Knowing that collar B moves downward with a constant acceleration and that its velocity is 8 mm/s after moving 32 mm, determine (a) the acceleration of block C, (b) the distance through which block C will have moved after 3 s.

6.

11.95 The three-dimensional motion of a particle is defined by the position vector $\mathbf{r} = (Rt \cos \omega_n t)\mathbf{i} + ct\mathbf{j} + (Rt \sin \omega_n t)\mathbf{k}$. Determine the magnitudes of the velocity and acceleration of the particle. (The space curve described by the particle is a conic helix.)

7.

11.108 The nozzle at A discharges cooling water with an initial velocity $\mathbf{v}_0$ at an angle of 6° with the horizontal onto a grinding wheel 350 mm in diameter. Determine the range of values of the initial velocity for which the water will land on the grinding wheel between points B and C.

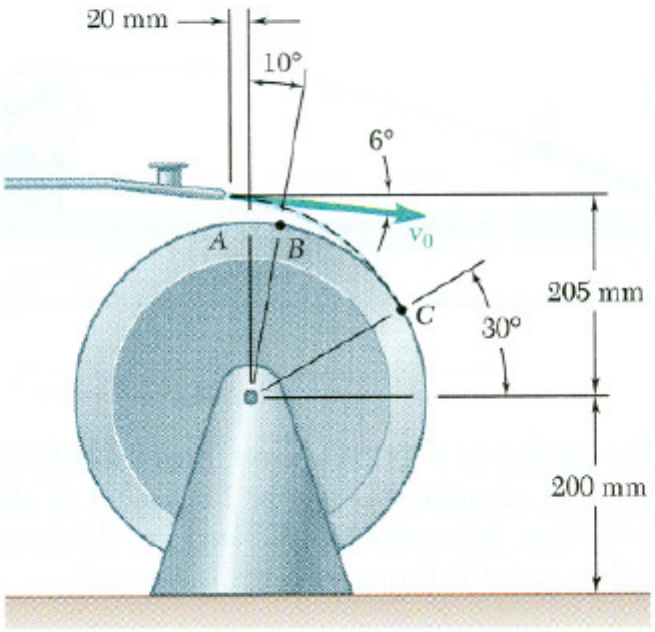

Fig. P11.108

8.

11.119 Shore-based radar indicates that a ferry leaves its slip with a velocity $\mathbf{v} = 9.8$ knots ⩤ 70°, while instruments aboard the ferry indicate a speed of 10 knots and a heading of 30° west of south relative to the river. Determine the velocity of the river. (1 knot = 1.852 km/h)

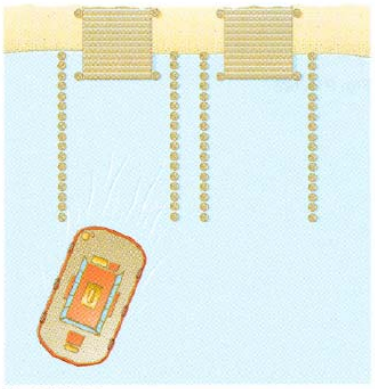

Fig. P11.119

9.

11.123 Knowing that at the instant shown block A has a velocity of 200 mm/s and an acceleration of 150 mm/s^2 both directed down the incline, determine (a) the velocity of block B, (b) the acceleration of block B.

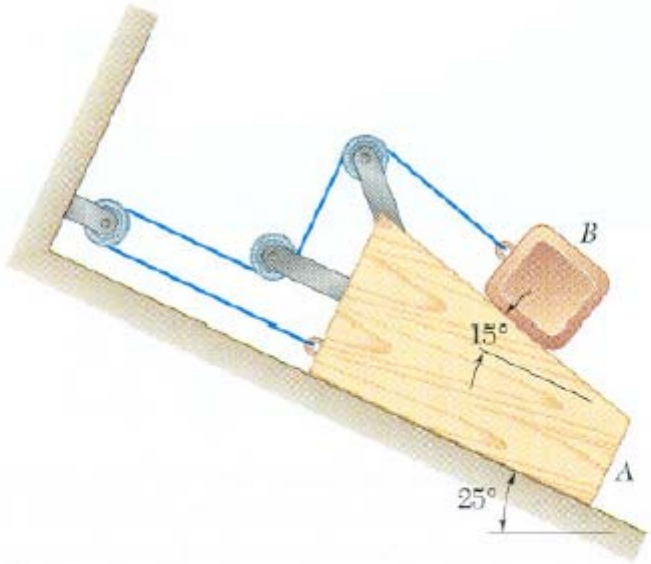

Fig. P11.123

10.

11.123 Slider block B starts from rest and moves to the right with a constant acceleration of 300 mm/s^2. Determine (a) the relative acceleration of portion C of the cable with respect to slider block A, (b) the velocity of portion C of the cable after 2 s.

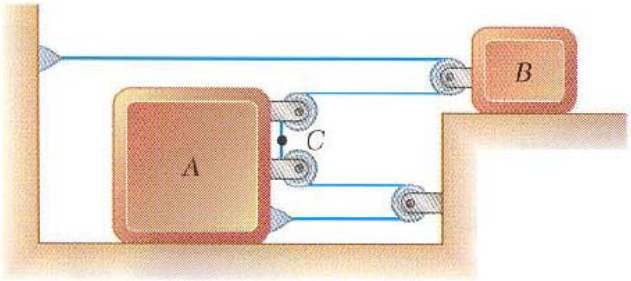

Fig. P11.123