اعدادى ديناميا

Kafrelsheikh University
Faculty of Engineering
Dept. Mech. Engineering
Year: Preparatory
Subject: Mechanics (I)_Dynamics

9

Semester: 2nd Semester
Final Examination
Date: May 23rd, 2016
Time allowed: 3 hours
Full Mark: 70

(a) No. of questions: 7-No. of pages: 7. Also, three unnumbered blank pages are available at the end of question-answer booklet.
(b) This is a close book exam. Only calculator is permitted
(c) Clear, systematic answers and solutions are required. In general, marks will not be assigned for answers and solutions that require unreasonable (in the opinion of the instructor) effort to decipher.
(d) Solve all questions.
(e) The exam will be marked out of 70. There are 7 marks bonus.

1. A subway car leaves station A; it gains speed at the rate of 2 m/s^2 for 6 s and then at the rate of 3 m/s^2 until it has reached the speed of 21 m/s. The car maintains the same speed until it approaches station B; brakes are then applied, giving the car a constant deceleration and bringing it to a stop in 6 s. The total running time from A to B is 30 s. **Draw** the a–t, v–t, and x–t curves, and determine the distance between stations A and B. **(11 Marks)**

Solution

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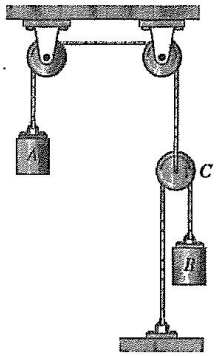
Dr. Roshdy F. Abu-Shanab
Dr. Mohamed O. Elsamadoni

2. Determine the velocity of block B at the instant when the velocity of block A is 1 m/s, directed downward. **(11 Marks)**



Solution

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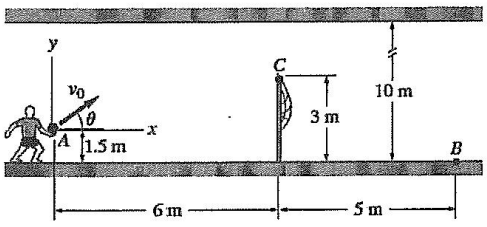
3. The volleyball player serves the ball from point A with the speed $v_0 = 12$ m/s at the angle $\theta = 28°$. (a) Derive the equation of the trajectory (y as a function of x) of the ball. (b) Determine whether the ball clears the top of the net C and lands inside the baseline B. **(11 Marks)**



Solution

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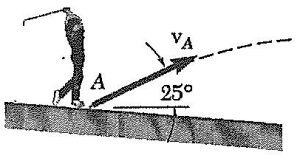
4. A golfer hits a golf ball from point A with an initial velocity of 50 m/s at an angle of 25° with the horizontal. Determine the radius of curvature of the trajectory described by the ball (a) at point A, (b) at the highest point of the trajectory. **(11 Marks)**



Solution

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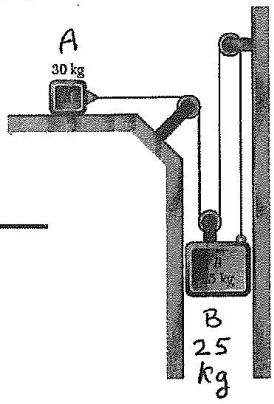
5. The two blocks shown are originally at rest. Neglecting the masses of the pulleys and the effect of friction in the pulleys and assuming that the coefficients of friction between block A and the horizontal surface are $\mu_s = 0.25$ and $\mu_k = 0.20$, determine (a) the acceleration of each block, (b) the tension in the cable. **(11 Marks)**



Solution

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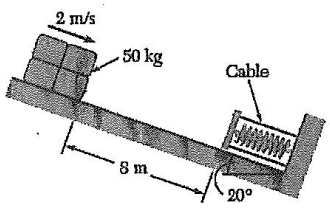
6. A spring is used to stop a 50-kg package which is moving down a 20° incline. The spring has a constant $k = 25\ kN/m$ and is held by cables so that it is initially compressed 50 mm. Knowing that the velocity of the package is $2\ m/s$ when it is $8\ m$ from the spring and the coefficient of kinetic friction between the package and the surface is 0.25. **Using the principle of work and energy**, determine (a) the maximum additional deformation of the spring in bringing the package to rest, (b) the velocity of the package as it passes again through the position shown. **(11 Marks)**



Solution

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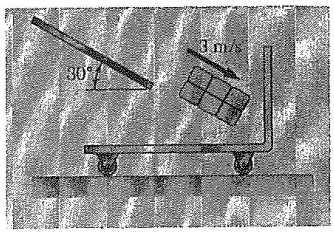
7. A 12-kg package drops from a chute into a 30-kg cart with a velocity of 3 m/s. Knowing that the cart is initially at rest and can roll freely, determine (a) the final velocity of the cart, (b) the impulse exerted by the cart on the package, (c) the fraction of the initial energy lost in the impact. **(11 Marks)**



Solution

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