



St. Francis Institute of Technology (Engg. College)

Internal Assessment Test-II

Academic Year: 2017-2018

Branch: FE

Year: F.E Semester: I

Subject: Engineering Mechanics

Time: 9:30am -10:30am

Date: 18/10/2017

No. of Pages: 02

Marks: 20 Marks

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

Note the following instructions.

1. All questions are compulsory.
2. Draw neat free body diagrams wherever necessary.
3. Write everything in ink (no pencil) only.
4. Assume data, if missing, with justification.

Q.1. Attempt any five.

- a. A wheel of radius 0.75 m rolls without slipping on a horizontal surface to the right. Determine the velocities of the points P and Q shown in fig – 1 below, when the velocity of centre of the wheel is 10 m/s towards right. **2M**
- b. A rod AB, 26m long leans against a vertical wall. The end A on the floor is drawn away from the wall at the rate of 24m/s, when the end A of the rod is 10m from the wall. Find the distance of instantaneous centre of rotation for the ladder from end A. **2M**
- c. The motion of a particle moving in a straight line is given by $S = t^3 - 3t^2 + 2t + 5$, where S is the displacement in meter and t is time in sec. Determine velocity and acceleration after 4 seconds. **2M**

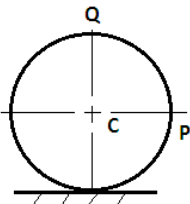


Figure 1

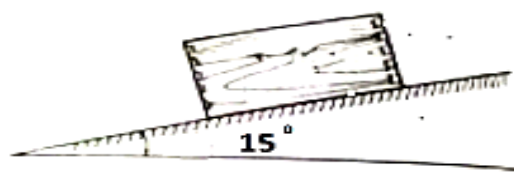


Figure 2

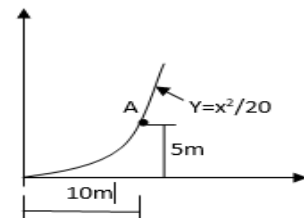


Figure 3

- d. What are the Laws of dry friction? **2M**
- e. A skier travels with a constant speed of 6m/s along the parabolic path $Y = X^2/20$ shown in the fig.3. Determine the radius of curvature at the instant he arrives at A. Neglect the size of the skier. **2M**
- f. A wooden block of 40 kg mass is kept on a rough inclined plane as shown in the fig 2 above. Comment on the status of motion. Take $\mu_s = 0.4$ and $\mu_k = 0.35$. **2M**

Q.2. Attempt any one.

- a. A particle is projected with an initial velocity of 2 m/s along a straight line. The relation between acceleration and time is given in figure 3. Draw $v - t$ and $s - t$ diagrams. **5M**

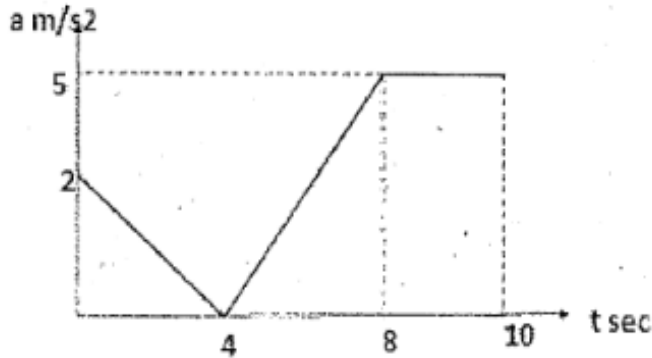


Figure 3

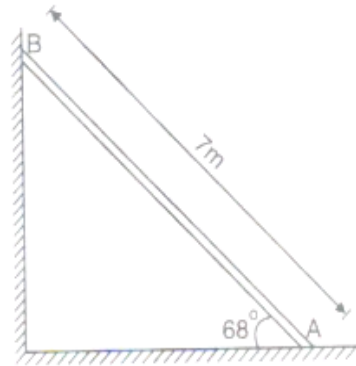


Figure 4

- b. A ladder of length 7m lean against a wall as shown in figure 4. Assuming that the coefficient of static friction is zero at B. Determine smallest value of μ_s at A for which equilibrium is maintained. **5M**

Q.3. Attempt any one.

- a. Block D shown in the figure 5 moves with a speed of 3 m/s. Determine angular velocity of link BD and AB and velocity of point B at the instant shown. **5M**

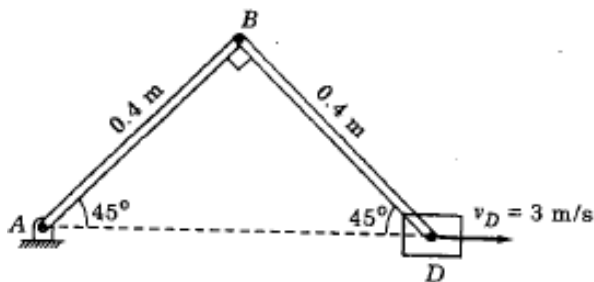


Figure 5

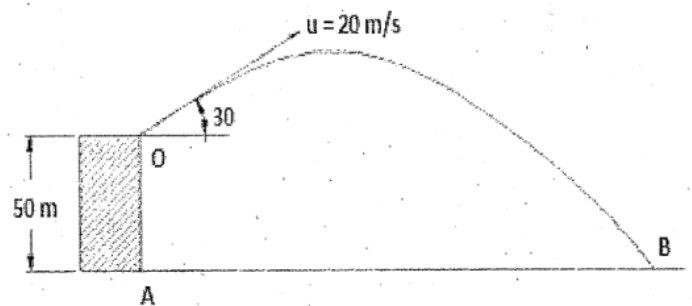


Figure 6

- b. A particle is projected from the top of a tower of height 50m with a velocity of 20m/sec at angle 30° to the horizontal. Determine : (i) total time taken to reach point B, (ii) the velocity with which it strikes the ground at B. (Refer Figure 6) **5M**