

# 國立臺北科技大學 104 學年度碩士班招生考試

系所組別：1301 車輛工程系碩士班

## 第三節 動力學 試題 (選考)

第一頁 共一頁

### 注意事項：

1. 本試題共 5 題，配分共 100 分。(每題 20 分)
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. The pendulum consists of a 30-lb sphere and a 10-lb slender rod. Compute the reaction at the pin  $O$  just after the cord  $AB$  is cut.

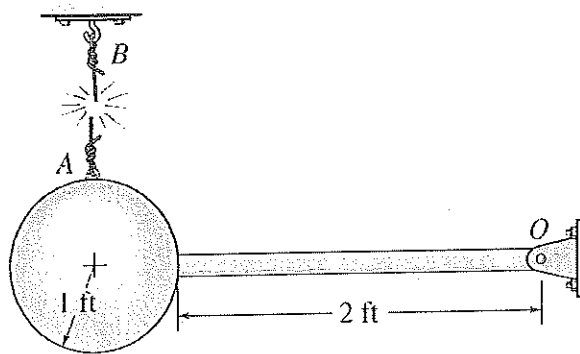


Figure 1 for Prob. 1

2. The  $v$ - $s$  graph for the car is given for the first 500 ft of its motion. Construct the  $a$ - $s$  graph for  $0 \leq s \leq 500$  ft. How long does it take to travel the 500-ft distance? The car starts at when  $t = 0$ .

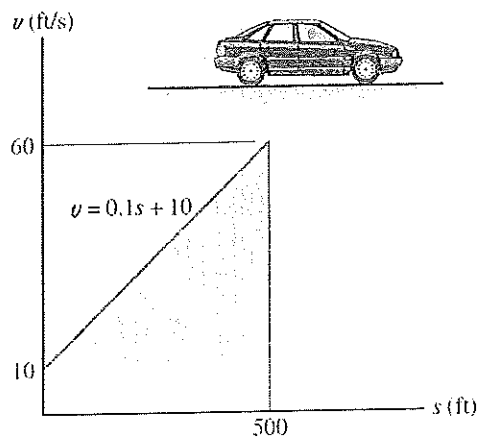


Figure 2 for Prob. 2

3. Member ABC has a weight of 2.27 kg and is attached to a pin support at B. A 0.68 kg sphere D strikes end C of member ABC with a vertical velocity  $v_1$  of 2.7 m/s. Knowing that  $L=76.2$  cm and that the coefficient of restitution between the sphere and member ABC is 0.5, determine immediately after the impact (a) the angular velocity of member ABC, (b) the velocity of the sphere.

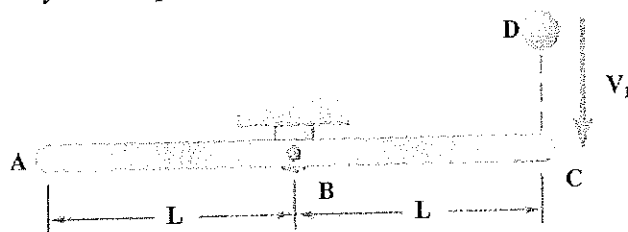


Figure 3 for Prob. 3

4. Sphere A of mass  $m$  and radius  $r$  rolls with a velocity  $\bar{v}_1$  on a horizontal surface when it hits squarely an identical sphere B that is at rest. Denoting by  $\mu_k$  the coefficient of kinetic friction between the spheres and the surface, neglecting friction between the spheres, and assuming perfectly elastic impact, determine (a) the linear and angular velocities of each sphere immediately after the impact, (b) the velocity of each sphere after it has started rolling uniformly.

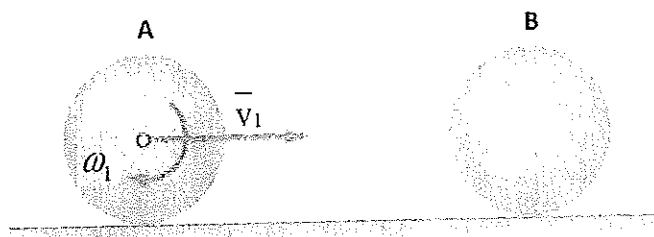


Figure 4 for Prob. 4

5. The motorcycle shown in the Figure 5 has a mass of 125 kg and a center of mass at  $G_1$ , while the rider has a mass of 75 kg and a center of mass  $G_2$ . Determine the minimum coefficient of static friction between the wheels and the pavement in order for the rider to do a "wheely," i.e., lift the front wheel off the ground as shown in the photo. What acceleration is necessary to do this? Neglect the mass of the wheels and assume that the front wheel is free to roll.

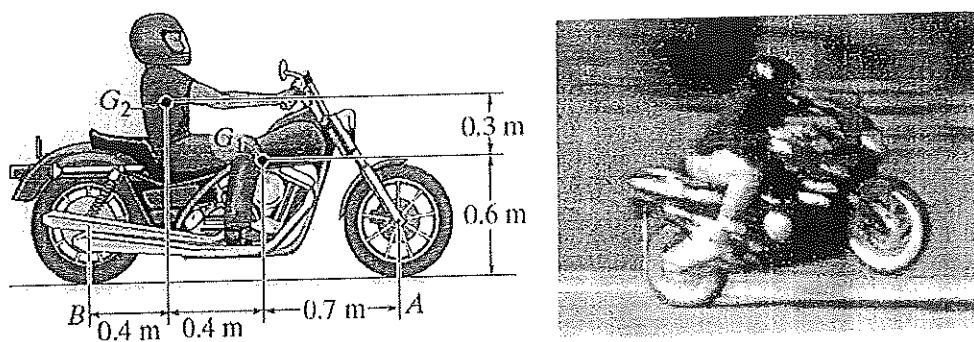


Figure 5 for Prob. 5