

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. The small block  $P$  in figure 1 moves with constant speed  $v$  in the circular path of radius  $r$  on the inclined surface. If  $\theta=0$  at time  $t=0$ , determine the  $x$ -,  $y$ - and  $z$ -components of velocity and acceleration as functions of  $v$ ,  $\phi$ , and  $t$ . (25%)
2. For the instant shown in figure 2, link  $CB$  rotates counterclockwise at a constant rate  $N$  and its pin  $A$  causes a rotation of the slotted member  $ODE$  with  $OD \perp DE$ . Determine the angular velocity  $\omega$  and angular acceleration  $\alpha$  of  $ODE$  for this instant. (25%)

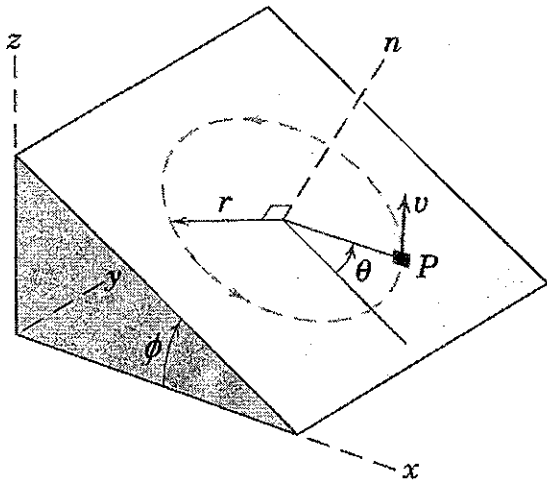


Figure 1

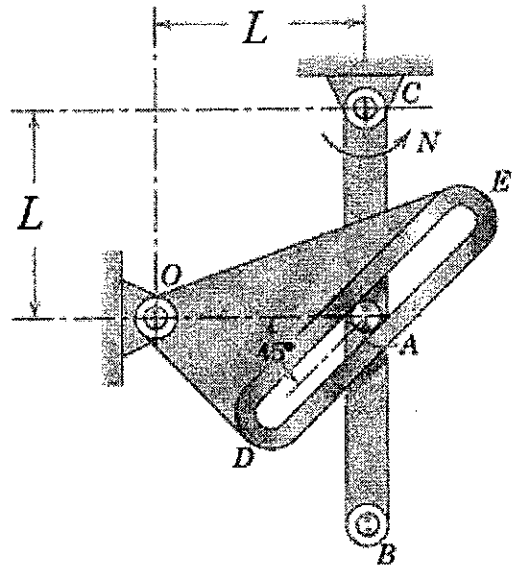
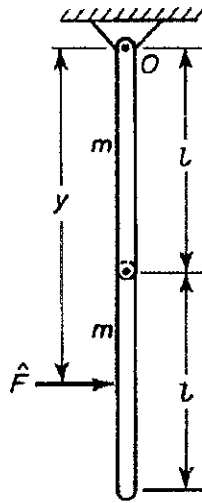


Figure 2

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3. (20%) Two thin uniform rods, each of mass  $m$  and length  $l$ , are connected in tandem to form a double pendulum. Assuming that the system initially hangs motionless, find the distance  $y$  from the pivot  $O$  at which a traverse impulse  $\vec{F}$  should be applied such that the two rods maintain their relative alignment immediately after the impulse is applied.



4. (30%) A solid uniform bowling ball of mass  $m$  and radius  $r$  has an initial velocity  $\vec{v} = v_0 \vec{i}$  and angular velocity  $\vec{\omega} = \omega_0 \vec{i}$  on a horizontal floor having a friction coefficient  $\mu$ .

- (a) Find the initial values of the linear acceleration  $\dot{\vec{v}}$  and the angular acceleration  $\dot{\vec{\omega}}$ .
- (b) What is the velocity of the ball when sliding stops?