國立虎尾科技大學 102 學年度第一學期博士班資格考試題

注意事項：
（1）本試題共有 5 題，每題 20 分，合計一百分。Closed book
（2）請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數
　　　時，謹採計作答順序較前之題目計分。
（3）使用計算機

1. A car moves in a straight line such that for a short time its velocity is defined by $v = (9t^2 + 2t)$ ft/s, where t is in seconds. Determine its position and acceleration when t = 3 s. When t=0, s=0.

2. A ball is thrown from a position 5 ft above the ground to the roof of a 40 ft high building, as shown in Fig.1. If the initial velocity of the ball is 70 ft/s, inclined at an angle 60º from the horizontal, determine the range or horizontal distance R from the point where the ball is thrown to where it strikes the roof.

3. The rod OA, shown in Fig. 2, is rotating in the horizontal plane such that $\theta=(t^3)$ rad. At the same time, the collar B is sliding outward along OA so that $r=(100t^2)$ mm. If in both cases t is in seconds, determine the velocity and acceleration of the collar when t=1 s.

4. The smooth 2 kg cylinder C in Fig. 3 has a peg P through its center which passes through the slot in arm OA. If the arm rotates in the vertical plane at a constant rate $\dot{\theta}$=0.5 rad/s, determine the force that the arm exerts on the peg at the instant θ=60º.

5. The 50 lb wheel shown in Fig.4 has a radius of gyration kG = 0.7 ft. If a 35 lb⌀ft couple moment is applied to the wheel, determine the acceleration of its mass center G. The coefficients of static and kinematic friction between the wheel and the plane at A are μ_s = 0.3 and μ_k = 0.25, respectively.
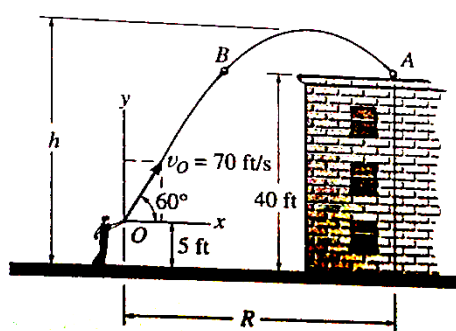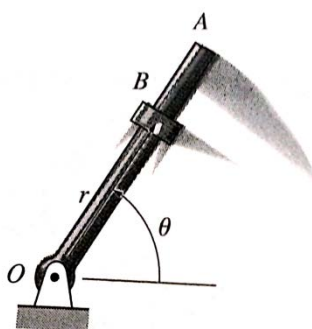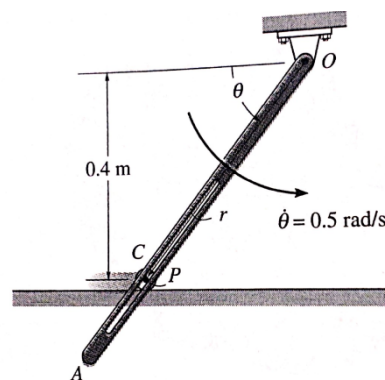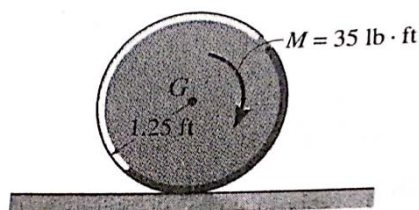

Figure 1　　　　　　Figure 2　　　　　　Figure 3

Figure 4