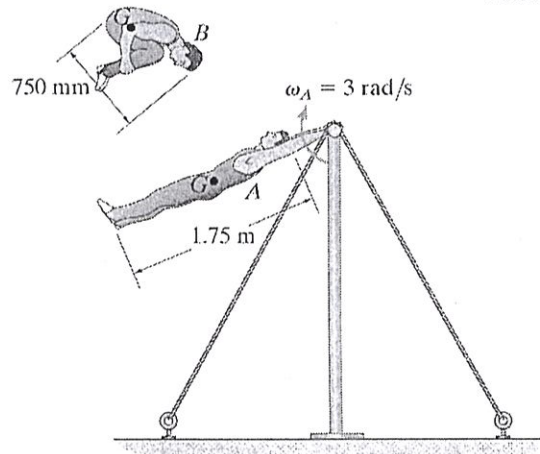


國立臺灣科技大學 104 學年度碩士班招生試題

系所組別：自動化及控制研究所甲組
 科目：動力學

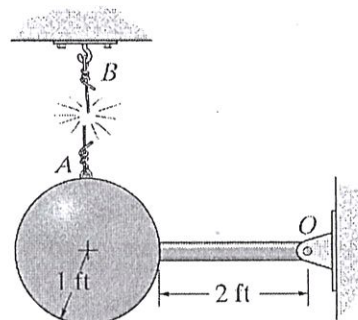
(總分為 100 分)

- The 75-kg gymnast lets go of the horizontal bar in a fully stretched position A , rotating with an angular velocity of $\omega_A = 3 \text{ rad/s}$. Estimate his angular velocity when he assumes a tucked position B . Assume the gymnast at positions A and B as a uniform slender rod and a uniform circular disk, respectively. (10%)



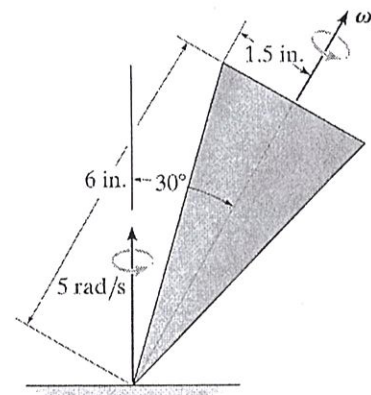
Problem 1

- 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. (20%)

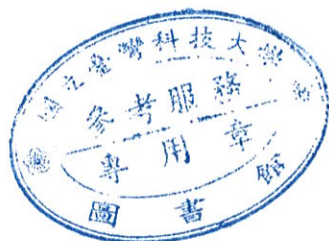


Problem 2

- The top has a weight of 3 lb and can be considered as a solid cone. If it is observed to precess about the vertical axis at a constant rate of 5 rad/s, determine its spin. (20%)



Problem 3



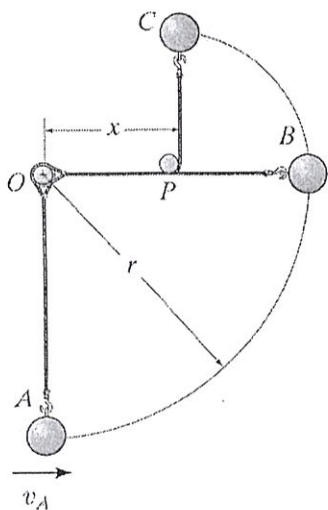
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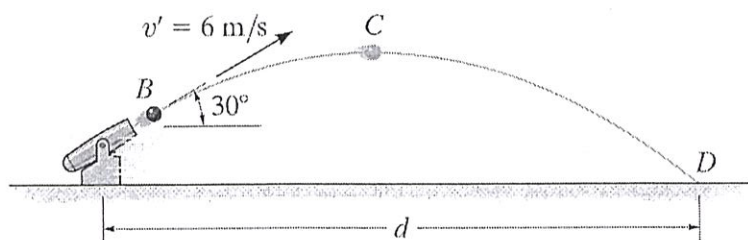
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(總分為 100 分)

4. The ball of mass m is given a speed of v_A at position A . When it reaches B , the cord hits the small peg P , after which the ball describes a smaller circular path.
- (a) If $v_A = \sqrt{3gr}$, determine the position x of P so that the ball will just be able to reach point C . (10%)
- (b) If $v_A = \sqrt{5gr}$ and $x = \frac{2}{3}r$, determine the speed of the ball and the tension in the cord when it is at the highest point C . (10%)

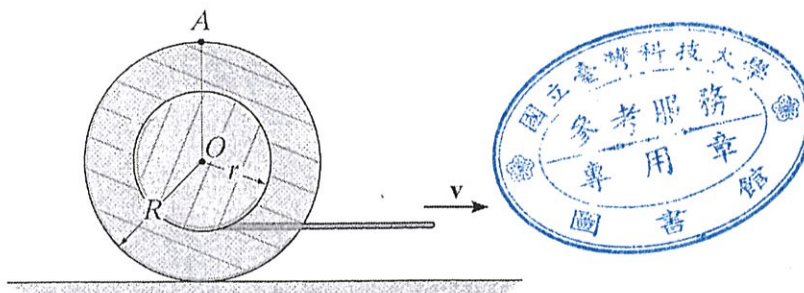


Problem 4



Problem 5

5. The 5-kg spring-loaded gun rests on the smooth surface. It fires a ball having a mass of 1 kg with a velocity of $v' = 6$ m/s relative to the gun in the direction shown. Neglect the size of the gun. If the gun is originally at rest,
- (a) Determine the horizontal distance d the ball is from the initial position of the gun at the instant the ball strikes the ground at D . (10%)
- (b) Determine the distance the ball is from the initial position of the gun at the instant the ball reaches its highest elevation C . (10%)
6. The spool rolls without slipping. When the cable is pulled to the right with a velocity of v ,
- (a) Determine the velocity of the center O of the spool. (5%)
- (b) Determine the velocity of point A on the outer rim of the spool at the instant shown. (5%)



Problem 6