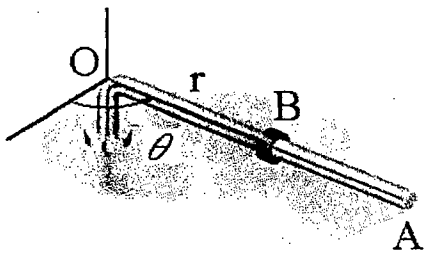
系組：機械工程學系數位機電碩士班 乙組　日期節次：98 年 3 月 21 日第 4 節 15:30-17:00

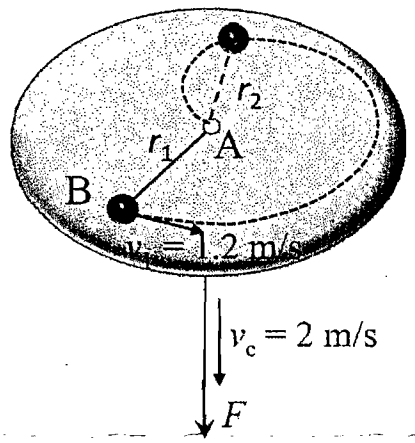
科目：**動力學[2832]**

1. The rob OA is rotating in the horizontal plane such that $\theta = (t^3)$ rad. At the same time, the collar B is sliding outwards along OA so that $r = (100t^2)$ mm. If in both cases, t is in seconds, determine the (a) **velocity** and (b) **acceleration** of the collar when t = 1s. (25%)

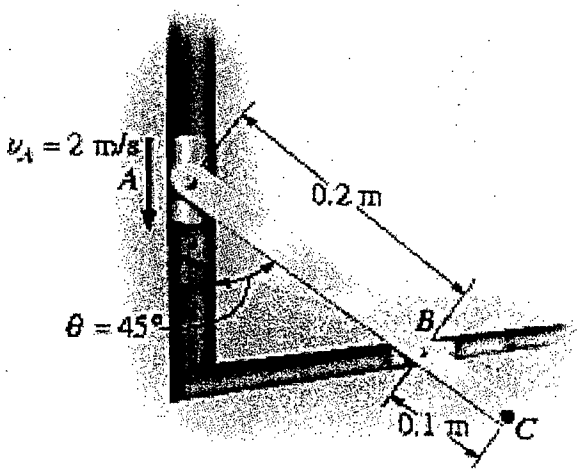


(hint: $\vec{v} = \dot{r}\vec{u}_r + r\dot{\theta}\vec{u}_\theta$; $\vec{a} = (\ddot{r} - r\dot{\theta}^2)\vec{u}_r + (r\ddot{\theta} + 2\dot{r}\dot{\theta})\vec{u}$)

2. The 0.4 kg ball B is attached to a cord which passes through a hole at A in a smooth table. When the ball is r_1 = 0.5 m from the hole, it is rotating around in a circle such that its speed is v_1 = 1.2 m/s. By applying a force F the cord is pulled downward through the hole with a constant speed v_c = 2 m/s. Determine (a) the speed of the ball at the instant it is r_2 = 0.2 m from the hole, and (b) the amount of work done by F in shortening the radial distance from r_1 to r_2. (25%)



3. The link is guided by two block A and B, which move in the fixed slots. If the velocity of A is 2 m/s downward, determine the velocity of B at the instant $\theta = 45°$. (25%)



4. The 5-kg slender rod is pinned at O and is initially at rest. If a 4-kg bullet is fired into the rod with a velocity of 400 m/s as shown in the figure, determine the angular velocity of the rod just after the bullet becomes embedded in it. (25%)