

國立臺灣師範大學 104 學年度碩士班招生考試試題

科目：動力學

適用系所：機電工程學系

注意：1.本試題共 2 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則不予計分。

1. The ball has a mass of m and a negligible size. It is originally traveling around the horizontal circular path of radius $r = r_0$ such that the angular rate of rotation is $\dot{\theta}_0$. If the attached cord ABC is drawn down through the hole at a constant speed V , determine the angular velocity of the ball and the tension the cord exerts on the ball at the instant when $r = r_0 / 2$. Neglect the effects of friction between the ball and horizontal plane. (Fig.1) (16 分)
2. The sphere of mass m falls and strikes the triangular block with a vertical velocity v . If the block rests on a smooth surface and has a mass $2m$, determine the velocities of block and sphere just after the collision. The coefficient of restitution is e . (Fig.2) (16 分)
3. At the instant shown, rod AB has an angular velocity ω_{AB} and an angular acceleration α_{AB} . Determine the angular velocity and angular acceleration of rod CD at this instant. The collar at C is pin-connected to CD and slides over AB. Given: $\omega_{AB} = 1 \text{ rad/s}$, $\alpha_{AB} = 1 \text{ rad/s}^2$, $L = 1m$. (Fig.3) (17 分)
4. What is the horizontal component of reaction force that the pin at A exerts on the slender bar of mass m when it is struck at P with a force of F ? Determine the position r so that horizontal component of reaction force at A is zero. (Fig.4) (17 分)
5. A thin disk of mass m has an angular velocity ω_1 while rotating on a smooth surface. Determine its new angular velocity just after the hook at its edge strikes the peg P and the disk starts to rotate about P without rebounding. What is the average reaction force at P if the impact occurs in Δt ? (Fig.5) (17 分)
6. The right circular cone ($\overline{AB} = \overline{AC}$) rotates about the z axis at a constant rate ω_1 without slipping on the horizontal plane. Determine the magnitudes of the velocity and acceleration of point C. (Fig.6) (17 分)

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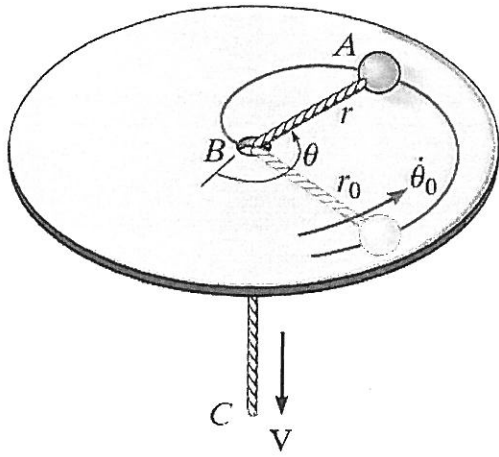


Fig. 1

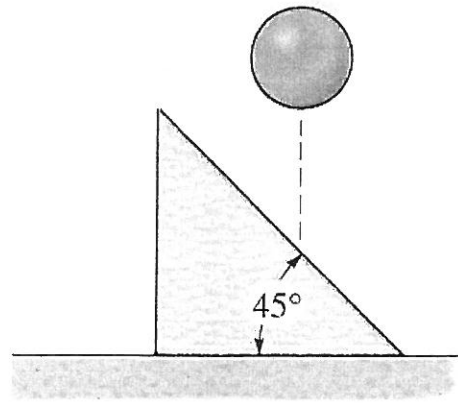


Fig. 2

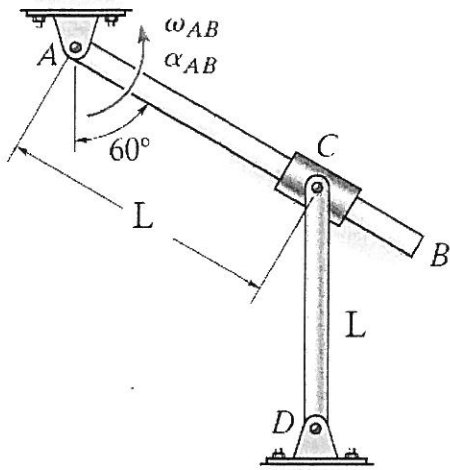


Fig. 3

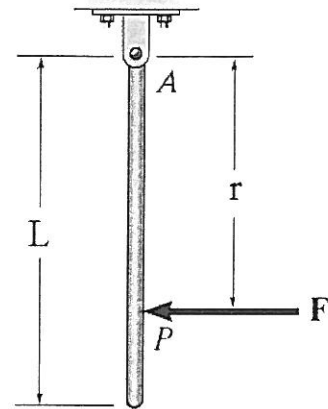


Fig. 4

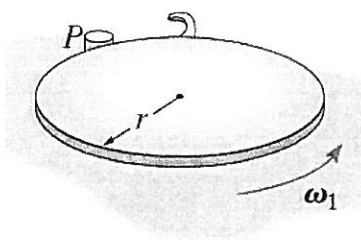


Fig. 5

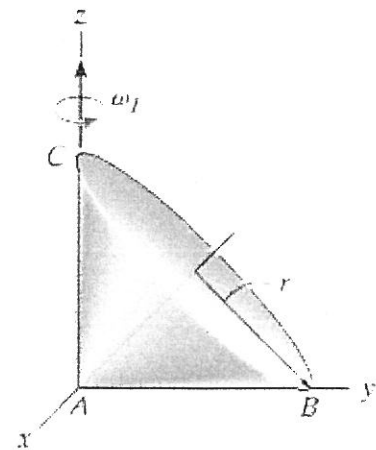


Fig. 6