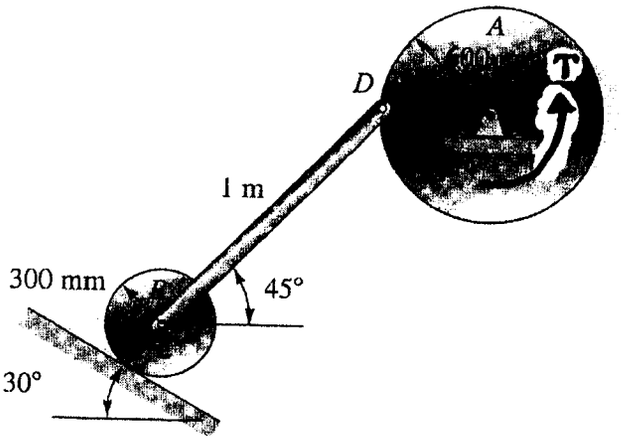
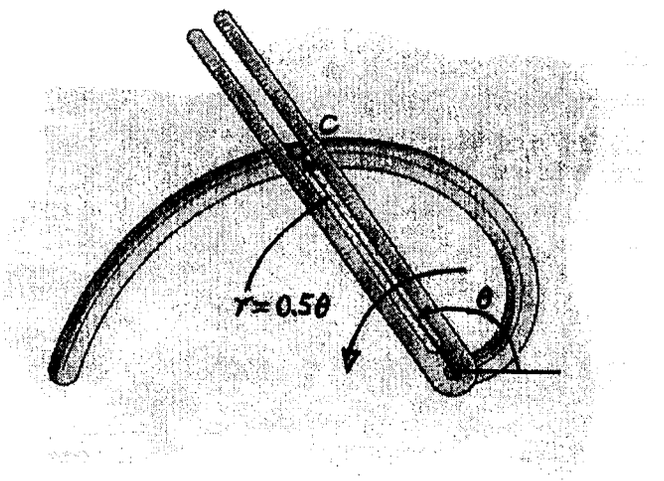
編號： 204　系所：奈米科技暨微系統工程研究所　　科目：工程力學

本試題是否可以使用計算機： ☑可使用 ， ☐不可使用 （請命題老師勾選）

1. A cylinder *A* is acted on by a torque *T* of 1,000 *Nt-m*. The cylinder has a mass of 75 *kg* and a radius of gyration of 400 *mm*. A *light* rod *CD* connects cylinder *A* with a second cylinder *B* having a mass of 50 *kg* and a radius of gyration of 200 *mm*. What is the force in member *CD* when torque *T* is applied? The system is stationary at the instant the torque is applied. Assume no slipping of cylinder *B* along the incline. (25 %)

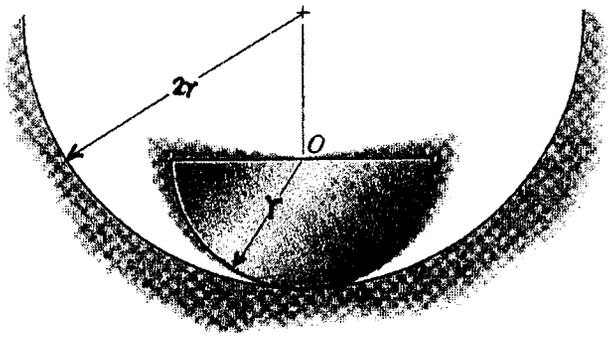


2. Using a forked rod, a *smooth* cylinder C having a mass of 0.5 *kg* is forced to move along the *vertical* slotted path $r = 0.5\ \theta$, where θ is in radians. If the angular position of the arm is $\theta = 0.5\ t^2$, where t is in seconds, determine the force of the rod on the cylinder and the normal force of the slot on the cylinder at the instant $t = 2\ s$. The cylinder is in contact with only one edge of the rod and slot at any instant. (25 %)



（背面仍有題目，請繼續作答）

3. The semicircular disk has a mass m and a radius r, and it rolls with slipping in the semicircular surface. Determine the natural period of vibration of the disk if it is displaced slightly and released. (25 %)



4. As shown in the figure, a particle of mass 1 *kg* can move along a *smooth* channel defined by $y=x^2$ on the vertical x-y plane. Besides gravitational force ($m\vec{g}$), there is another force acting on the particle on the x-y plane and is described as

$\vec{F}(x,y) = -(x^2+2xy)\,\vec{i} - (x^2+2)\,\vec{j}$ (Nt). If the particle is released from rest at position A, please determine the velocity when the particle reaches the origin point, $(x, y) = (0, 0)$. (25 %)