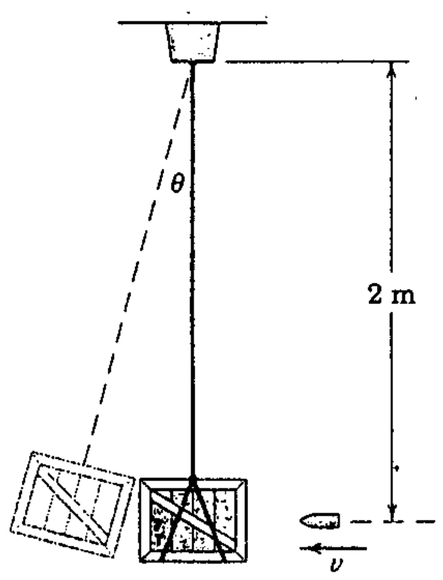
國立臺灣科技大學
九十學年度碩士班招生考試試題

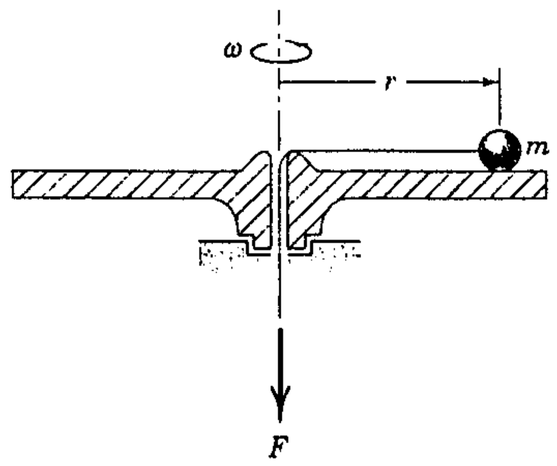
系所組別： 機械工程系甲組
科　目： 動力學

共四題，每題 25 分，可不依序作答，但題號務必標示清楚。解題請寫明所依據的原理，並繪明相關圖示。

1. The ballistic pendulum is a simple device to measure projectile velocity by observing the maximum angle to which the box of sand with embedded projectile swings. Calculate the angle θ if the 100-g projectile is fired horizontally into the suspended 20-kg box of sand with a velocity of v = 600 m/s. Also find the percentage of energy lost during impact.



2. The small particle of mass m and its restraining cord are spinning with an angular velocity ω on the horizontal surface of a smooth disk, shown in section. As the force F is slightly relaxed, r increases and ω changes. Determine the rate of change of ω with respect to r, $d\omega/dr$, and show that the work done by F during a movement dr equals the change in kinetic energy of the particle.



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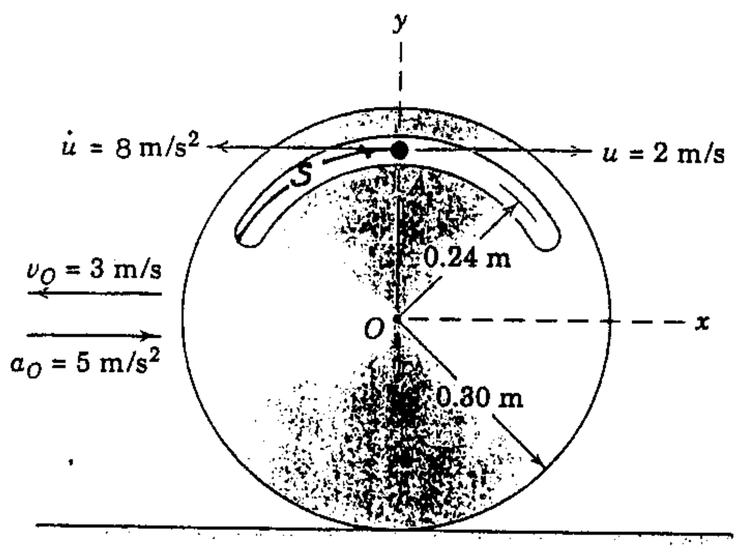
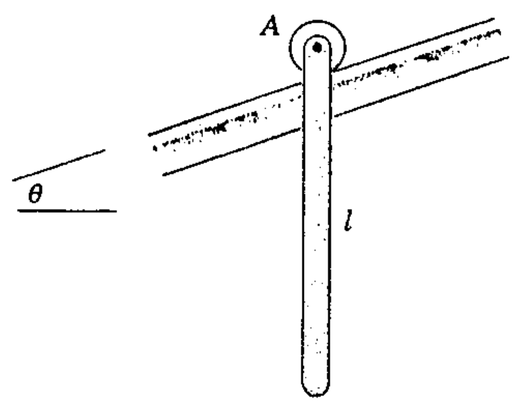
3. The disk rolls without slipping on the horizontal surface, and at the instant represented, the center O has the velocity and acceleration shown in the following figure. For this instant, the particle A has the indicated speed $u = \dot{s}$ and time-rate-of-change of speed $\dot{u} = \ddot{s}$, both relative to the disk. Determine the absolute velocity and acceleration of particle A.



4. The slender rod of mass m and length l is released from rest in the vertical position with small roller at end A resting on the incline. Determine the initial acceleration of A. Neglect the mass of the small roller.



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