

淡江大學八十九學年度碩士班招生考試試題

系別：航空太空工程學系

科目：動力學

本試題共 / 頁

- (30%) A particle of mass m moves along a fixed helix of radius R and helix angle γ . An external force of constant magnitude F_0 is applied to the particle in a tangential direction forward along the path. Assuming a coefficient of friction μ between the particle and the helix, and assuming no gravity, find:
 - The differential equation for the displacement s of the particle along the path.
 - The maximum velocity of the particle if it starts from rest.
- (35%) A massless disk of radius R has an embedded particle of mass m at a distance $(1/2)R$ from the center. The disk is released from the position shown in Figure 1 and rolls down the fixed plane, $\theta(0) = 0$, $\dot{\theta}(0) = 0$. Find:
 - $\dot{\theta}$ as a function of θ ;
 - the position θ for which the particle is momentarily constant in speed.
- (35%) An airplane flies with a constant speed v in a level turn to the left at a constant radius R . The propeller is of radius r and rotates about its axis clockwise (as viewed from the rear) at a constant angular rate Ω . Find the total acceleration of a point P at the tip of the propeller, assuming that the propeller axis is aligned with the flight path. Use the cylindrical unit vectors \bar{e}_r , \bar{e}_ϕ , \bar{e}_z (\bar{e}_ϕ into page). (Refer to Figure 2)

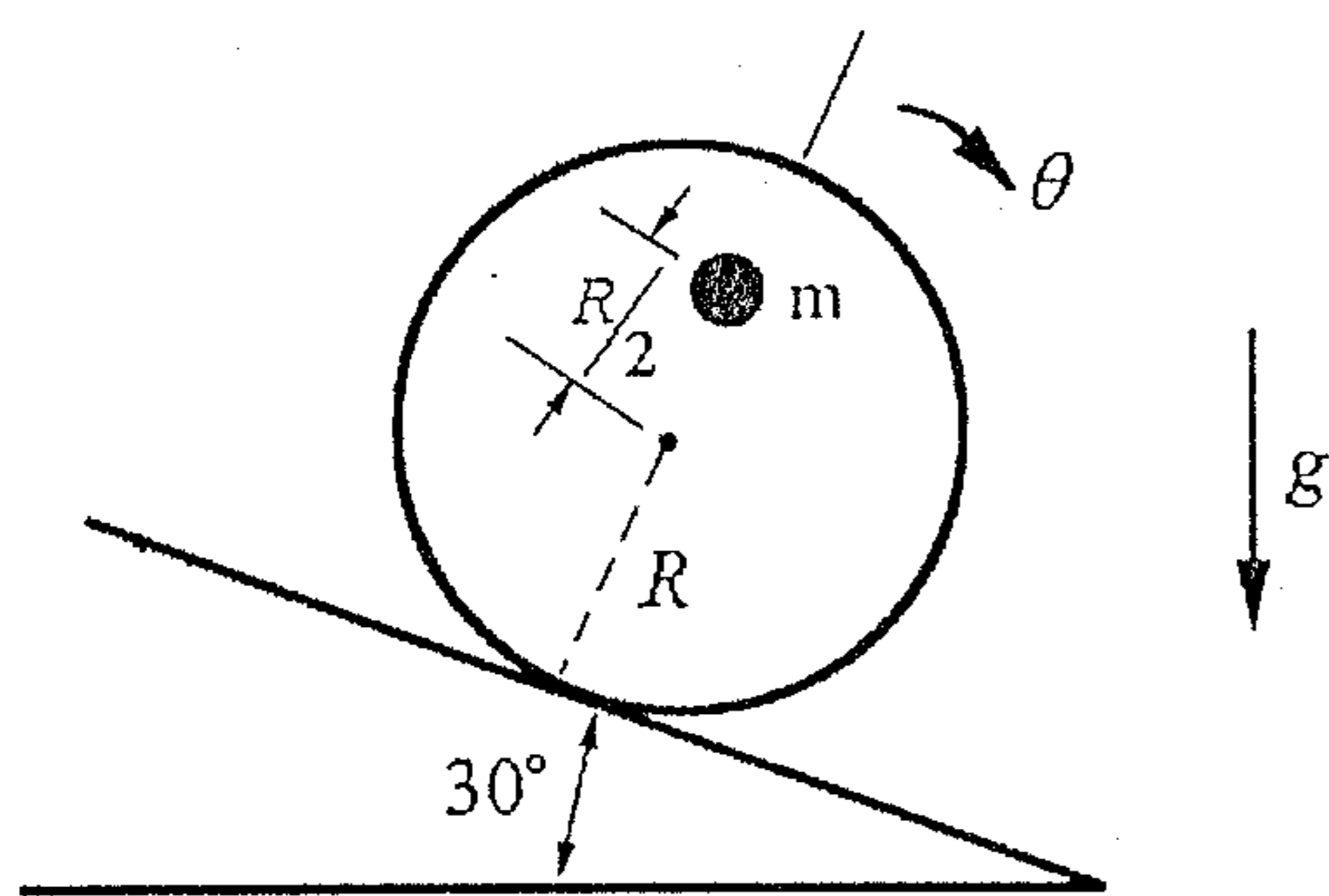


Figure 1

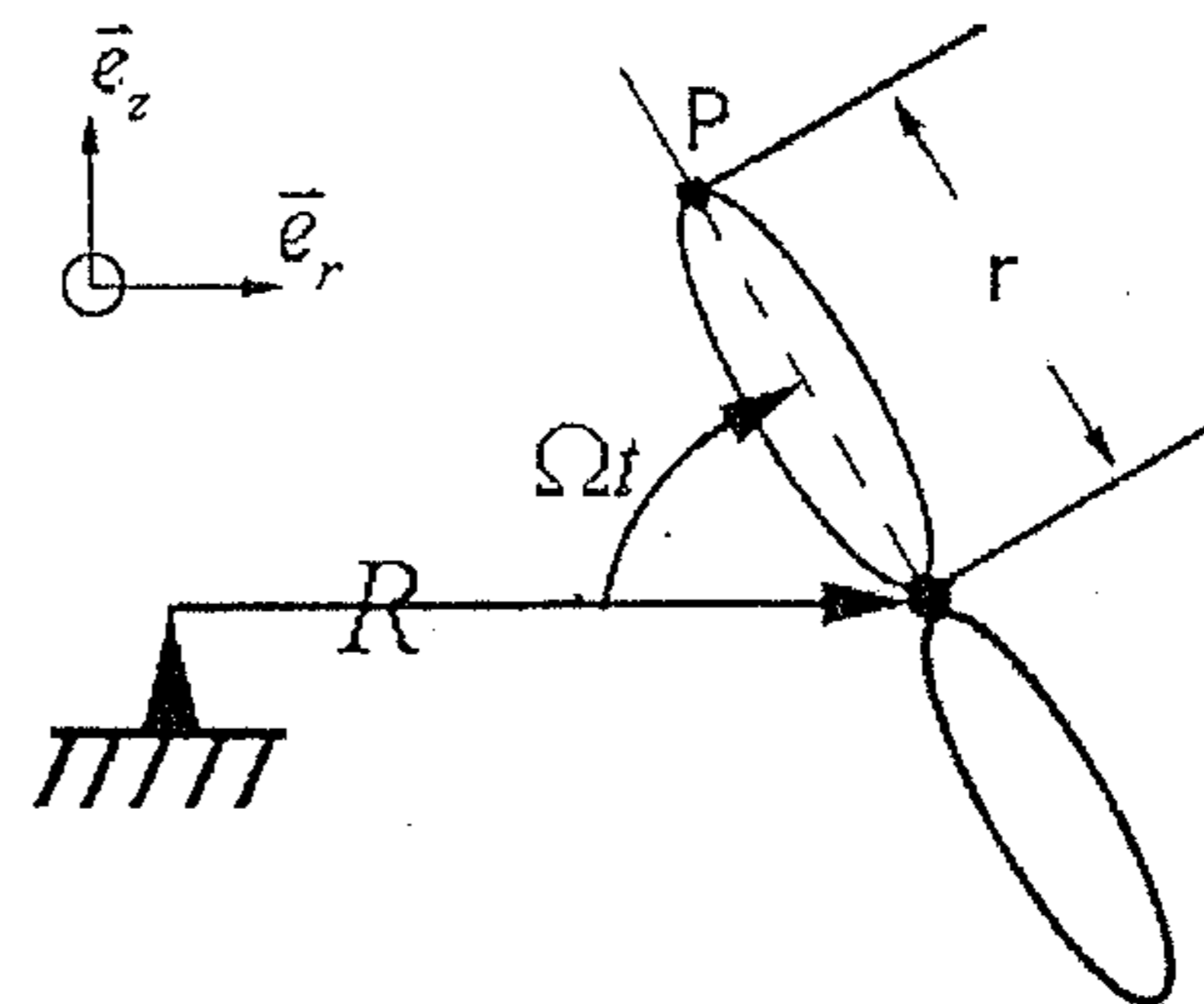


Figure 2