

1) A solid cylinder of radius R and length L rotates with the constant angular velocity ω in a sleeve of thickness $\delta (\ll R)$ and of the same length as the cylinder (Fig. 1). The pressure p and the coefficient of dry friction μ between the cylinder and sleeve are assumed to be uniform. The peripheral and axial heat transfer coefficients are h_1 and h_2 , respectively. The ambient temperature is T_∞ . Find the steady temperature of the system.

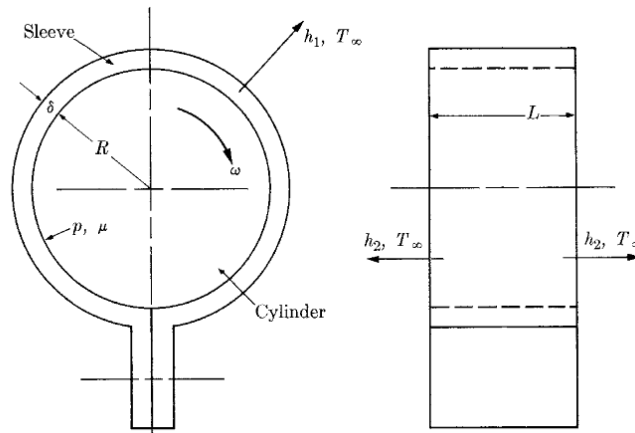
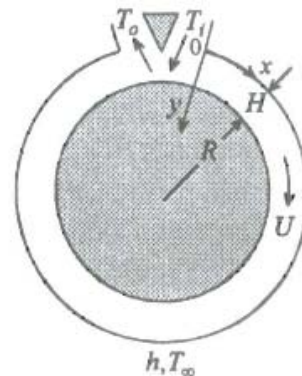


Fig.1

2) Liquid metal flows through a cylindrical channel of width H and inner radius R . It enters at T_i and is cooled by convection along the outer surface to T_o . The heat transfer coefficient is h and the ambient temperature is T_∞ . The inner surface is insulated. Assume that the liquid metal flows with a uniform velocity U and neglect curvature effect ($H/R \ll 1$), determine the steady state temperature of the insulated surface.



۳) دو استوانه مشابه به شعاع r_0 و طول L در راستای محور تحت نیروی F فشرده شده و در جهات مختلف با سرعت زاویه ای یکسان ω به گردش در می آیند. ضریب اصطحکاک بین دو سطح برابر μ می باشد. سطح سیلندرها گرما را بوسیله جابجایی انتقال می دهد. دمای پایدار سطح تماس $(z=0)$ را بر اساس شعاع بدست آورید.

