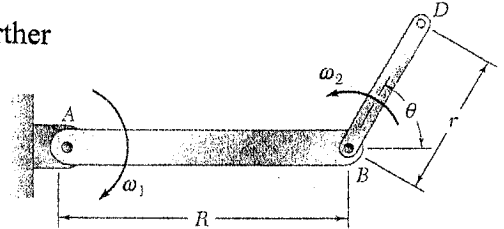


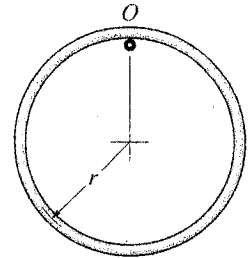
系所別: 機械工程學系丁、戊組 科目:

動力學

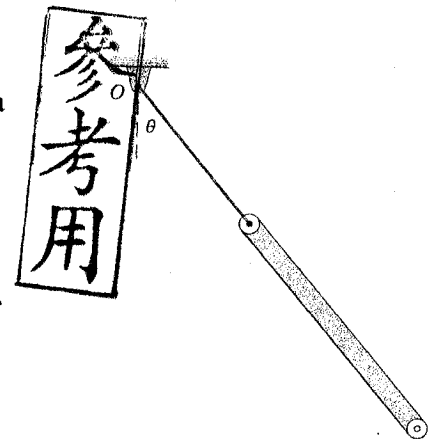
1. (25%) Rod  $AB$  of length  $R$  rotates about  $A$  with a constant clockwise angular velocity  $\omega_1$ . At the same time, rod  $BD$  of length  $r$  rotates about  $B$  with a constant counterclockwise angular velocity  $\omega_2$  with respect to rod  $AB$ . Show that if  $\omega_1 = 2\omega_2$ , the acceleration of point  $D$  passes through point  $A$ . Further show that this result is independent of  $R$ ,  $r$ , and  $\theta$ .



2. (25%) The thin hoop is supported by a peg at  $O$ . Determine the period of oscillation for small amplitudes of swing. The hoop has a mass  $m$ .



3. (25%) The bar, of mass  $m$  and length  $L$ , is suspended by a light cord from a fixed point  $O$  and is released from rest in the position shown.
- Draw the free-body diagram. (5%)
  - Calculate the acceleration of the bar. (15%)
  - Can the bar remain in line with the cord as it swings? Specify your reasons. (5%)



4. (25%) The free-rolling ramp has a weight of  $60 \text{ kgf}$ . Assume that the ramp is smooth, and neglect the mass of the wheels. The boy whose weight is  $40 \text{ kgf}$  slides  $5 \text{ m}$  down the ramp to go from  $A$ , where he takes a rest, to  $B$ .
- Determine the ramp's speed when the boy reaches the bottom at  $B$ . (20%)
  - Please discuss in brief how you deal with this problem! (5%)

