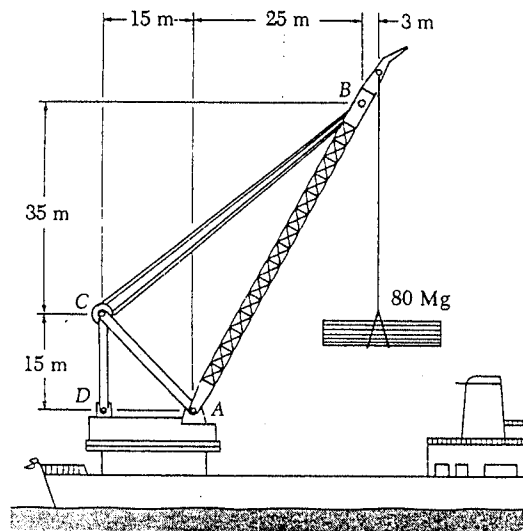
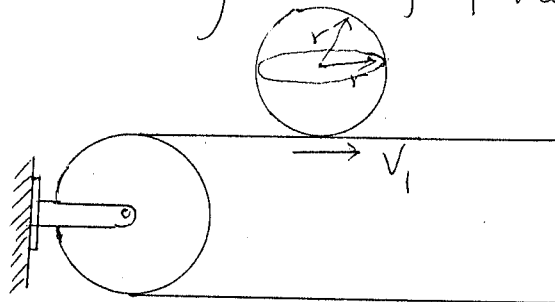


1. Define or describe following terms. (定義或描述下列的名詞)
  - a. (5%) Statics (靜力學)
  - b. (5%) Coefficient of rolling resistance (滾動摩擦係數)
  - c. (5%) Mechanical efficiency (機械效率)
  - d. (5%) Unstable structures (不穩定的結構)
  
2. Convert following units in terms of kg, mm, and sec. (轉換下列的單位，表示成 kg、mm、及 sec 的組合)
  - a. (5%) 1 Pascal (壓力單位)
  - b. (5%) 1 Watt (功率單位)
  
3. (20%) For the crane shown, determine (a) the force in the link  $CD$ , (b) the force in the brace  $AC$ , (c) and the force exerted at  $A$  on the boom  $AB$ .



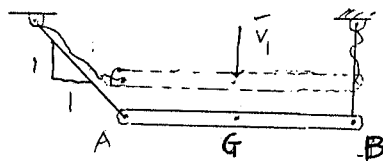
(背面仍有題目.請繼續作答)

4. A uniform sphere of radius  $r$  and mass  $m$  is placed with no initial velocity on a belt which moves to the right with a constant velocity  $v_1$ . Denoting by  $\mu_k$  the coefficient of kinetic friction between the sphere and the belt, determine (a) the time  $t_1$  at which the sphere will start rolling without sliding, (b) the linear velocity and the angular velocity of the sphere at the time  $t_1$ .



(15%)

5. A slender rod of length  $L$  is falling with a velocity  $\bar{v}_1$  at the instant when the cords simultaneously become taut. Assuming that the impacts are perfectly plastic, determine the angular velocity of the rod and the velocity of its mass center immediately after the cords become taut.



(15%)

- b. The essential structure of a certain type of aircraft turn indicator is shown. Spring AC and BD are initially stretched and exert equal vertical forces at A and B when the airplane is traveling in a straight path. Each spring has a constant of  $600 \text{ N/m}$  and the uniform disk has a mass of  $250 \text{ g}$  and spins at the rate of  $16000 \text{ rpm}$ . Determine the angle through which the yoke will rotate when the pilot executes a horizontal turn of  $800 \text{ m}$  radius to the right at a speed of  $720 \text{ km/h}$ .

(20%)

$l = 120 \text{ mm}$   
 $r = 50 \text{ mm}$

