1. Each of the bars OA and AB has mass 10 kg and the disk at B has mass 20 kg. The system, as shown in Fig. 1, is released from rest in the position where $\theta = 60°$. If the disk rolls without slipping, determine :
   (a) the angular velocity of the bar OA when $\theta = 30°$. (15%)
   (b) the angular velocity of the bar AB when $\theta = 0°$. (15%)

2. The elevator E with its freight has a total mass of 1000 kg and is hoisted by its 400-kg counterweight C and the motor at M as shown in Fig.2. If the motor has an efficiency of 0.8, determine the power that must be supplied to the motor when the elevator
   (a) is moving upward at a constant speed of 2 m/s. (10%)
   (b) has an instantaneously upward velocity of 2 m/s and an upward acceleration of 1 m/s^2. (10%)

3. If the bodies A and B, as shown in Fig.3, have masses $m_A = 400$ kg and $m_B = 0$ kg and $\mu_s = 0.3$ between all surfaces of contact, determine the range of the magnitudes of P if equilibrium exists. (24%)

4. For the beam loaded as shown in Fig.4,
   (a) determine the reactions at the supports A and B. (6%)
   (b) draw the shear and moment diagrams. (10%)
   (c) compute the maximum normal and shear stresses in this beam with cross-sectional dimensions 10mm × 20mm. (10%)

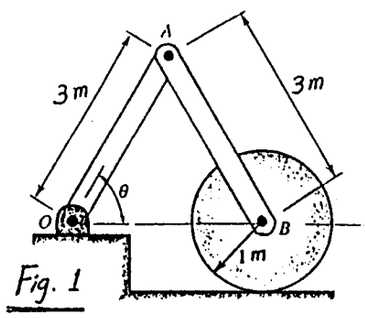

Fig. 1

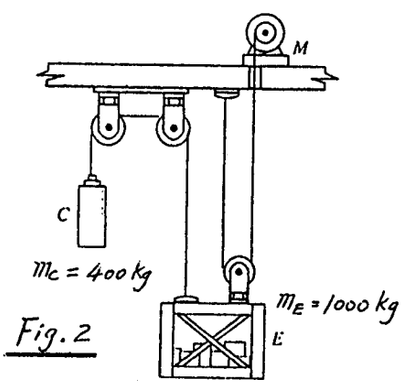

Fig. 2

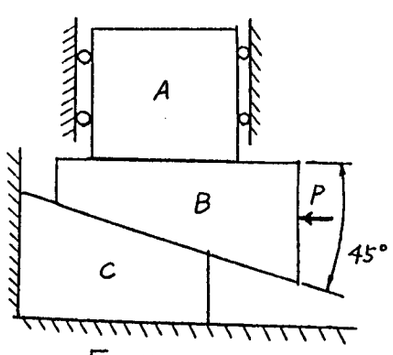

Fig. 3

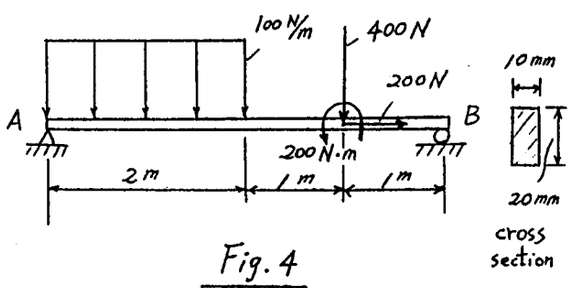

Fig. 4