1. The "quick return" mechanism consists of a crank AB, slider block B, and slotted link CD. If the crank has the angular motions as shown in Figure 1, determine the angular velocity and angular acceleration of the slotted link at the instant. (25%)

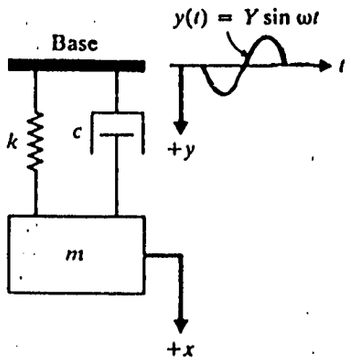

Figure 1

2. Consider a damped system under the harmonic motion of the base, as shown in Figure 2. Derive the governing equation of motion and find the steady-state response of the mass. (25%)

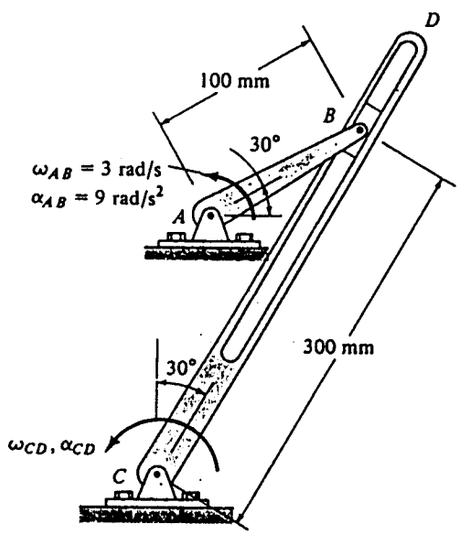

Figure 2

3 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. 3, 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%)

4. 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 4. 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%)

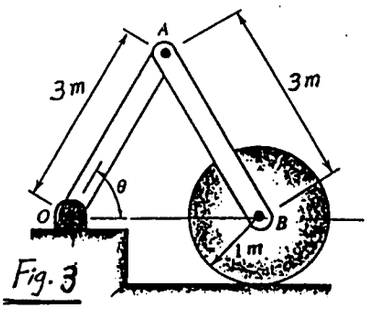

Fig. 3

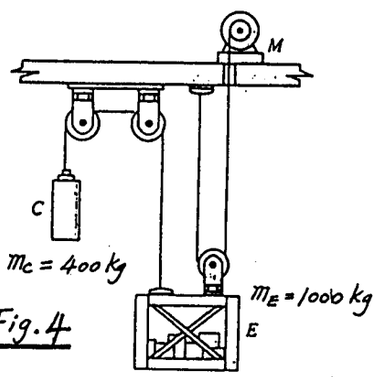

Fig. 4