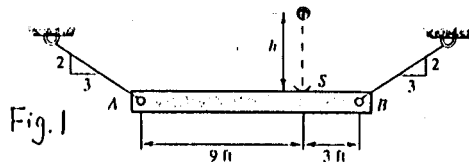1. A 10-lb small sphere is dropped from a height h = 5 ft and strikes the 30 lb slender plank AB with a perfectly plastic impact as shown in Fig. 1. Determine the angular velocity of the plank just after the impact.(20%)


Fig.1

2. The disk A is dropped from rest in the position shown in Fig.2. It falls onto the disk B which is resting on a spring of modulus k = 120 lb/ft. If restitution coefficient e = 0 between A and B , (i) determine the maximum deflection of the disk B. (10%)(ii) find the equation of motion of the system after the impact(5%). (iii) find the natural frequency of the system after the impact(5%)

Fig.2
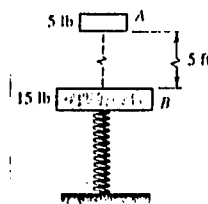
3. A 10-kg block is released from rest in the position A_1 to be moved up a smooth incline by the constant force P of 500 N as shown Fig. 3. The attached spring has a modulus of 400 N/m and is stretched 120 mm when the block is in the position A_1. Determine the speed of the block as it passes through the position A_2. (20%)

Fig. 3
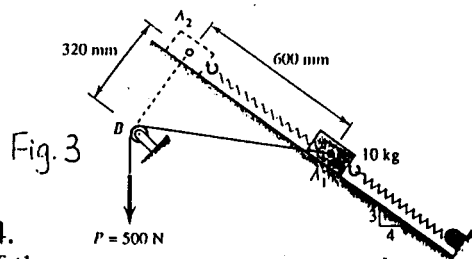
4. The disk rotates with the angular motion shown in Fig. 4. Determine the angular velocity and angular acceleration of the slotted link AC at this instant. The peg at B is fixed to the disk.(20%)

Fig.4

ω = 6 rad/s
α = 10 rad/s²
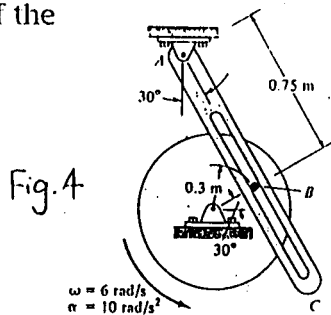
5. A car starts from rest at point A and travels along the horizontal track in Fig. 5. During the motion, the increase in speed is a_t = (0.2t) m/s² , where t is in seconds. Determine the magnitude of the car's acceleration when it arrives at point B.(20%)

Fig.5