1. (25%) The smooth disk in figure 1 is pinned at D and has a weight of 400 N. Neglecting the weights of the other members, determine
(a) the reaction forces at A and C,
(b) the reaction forces at pins B and D.

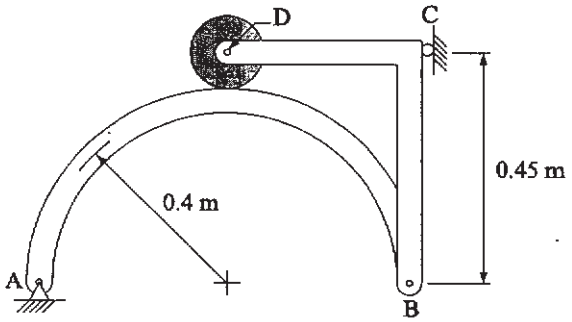

Figure 1

2. (25%) As shown in figure 2, if the coefficients of static friction at contact points A and B are μ_s =0.3 and 0.4, respectively, determine the smallest force P that will cause the 200-kg spool (R=500 mm, r=300 mm) to have impending motion.

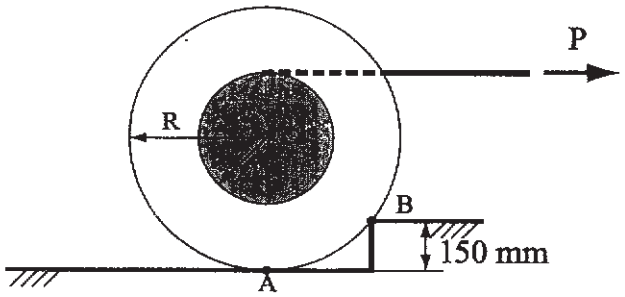

Figure 2

3. (15%) Starting from rest, a man runs outward in the radial direction from the center of a circular platform shown in figure 3 with a constant acceleration of 0.5 m/s^2. If the platform is rotating at a constant rate $\dot{\theta}$ = 0.2rad/s , determine the radial and transverse components of the velocity and the acceleration of the man when t= 3s. Neglect the weight and size of the man.

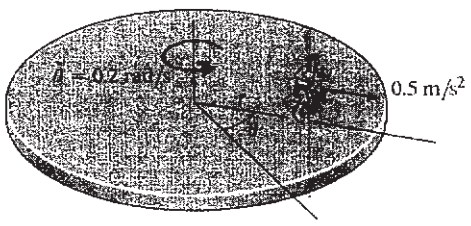

Figure 3

4. (15%) A block of mass m is placed at a distance r from the center of a turntable as shown in figure 4. If the static friction coefficient between the block of mass and the turntable is μ_s, the gravitational acceleration is g, determine the maximum constant angular velocity $\dot{\theta}$ of the turntable without causing the block to slip.

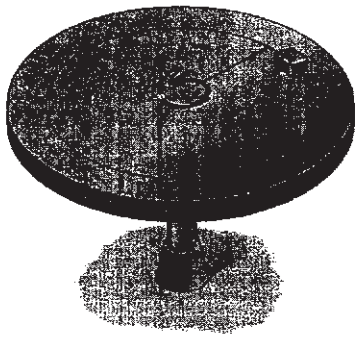

Figure 4

5. (20%) A system consists of a 10 kg disk of radius $r = 0.5$m with its center at B, a 2 kg slender rod BC having a length of 2m and a 0.5 kg smooth collar C as shown in figure 5. If the system is released from rest at a starting point at $\theta = 45^{\circ}$, and we assume the disk rolls without slipping, determine the velocity of the collar C at the instant when $\theta = 30^{\circ}$.

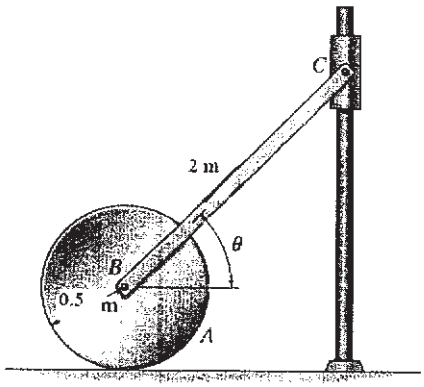

Figure 5