

Name \_\_\_\_\_ Section \_\_\_\_\_

**ES204**  
Examination II  
January 24, 1997

Problem	Score
1	/35
2	/35
3	/30
Total	/100

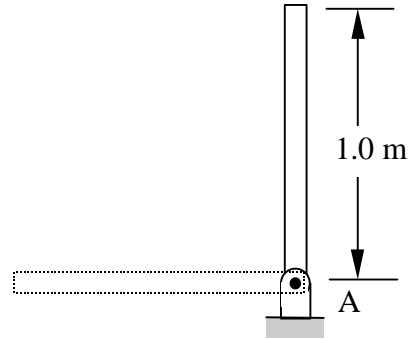
Show all work for credit  
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Name \_\_\_\_\_  
ES204 Examination II

**Problem 1**

35 pts  
Jan. 24, 1997

The 2 kg slender bar is displaced slightly from its vertical position and is allowed to fall. What are the reaction forces at point A when the bar is horizontal?

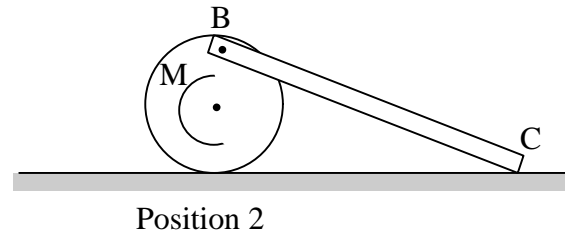
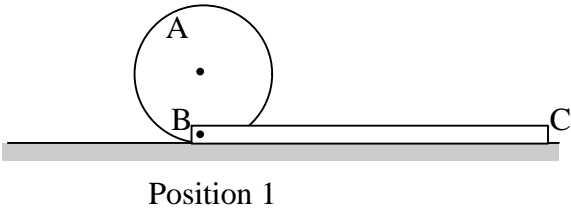


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**Problem 2**

35 pts  
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Disk A ( $I_G = 2 \text{ kg}\cdot\text{m}^2$ ,  $m = 16 \text{ kg}$ ) is pinned to bar BC ( $L = 1 \text{ m}$ ,  $m = 12 \text{ kg}$ ,  $I_G = 1 \text{ kg}\cdot\text{m}^2$ ) and is initially at rest in position 1 shown when a constant clockwise moment  $M = 100 \text{ N}\cdot\text{m}$  is applied. The distance between the center of the disk and B is  $0.45 \text{ m}$  and the radius of the disk is  $0.5 \text{ m}$ . Assuming the disk rolls without slipping on the ground and the friction between the end of the bar and the ground is negligible, what is the angular velocity of the disk when the bar is in position 2 as shown below.



A slender bar rotates freely in the horizontal plane about a vertical shaft at O. The bar weighs 10 kg and its length is 2 m. The slider A weighs 1 kg and can be treated as a point mass, that is, the mass moment of inertia about its center of mass is negligible. If the bar's angular velocity is  $\omega = 10$  rad/s and the radial component of A is zero when  $r = 0.4$  m,

a) calculate the angular velocity of the bar  
when  $r = 1.0$  m

b) (not asked 1997) determine the velocity of A when  $r = 1.0$  m.

