

※ 注意：全部題目均請作答於試卷內之「非選擇題作答區」，請標明題號依序作答。

Note:

- The solutions may not necessarily shown in order. Mark, however, the number of problems for your solutions clearly. Test takers are responsible for not being able to show the number clear.
- Write your answer down clearly, cleanly, and precisely.

1. **20pts** A spring with a torsional stiffness k is attached to the pin at B . It is unstretched when the rod assembly is in the vertical position. Determine the weight W of the block that results in neutral equilibrium. Write your final answer in the form: ($W = \underline{\hspace{2cm}}$)

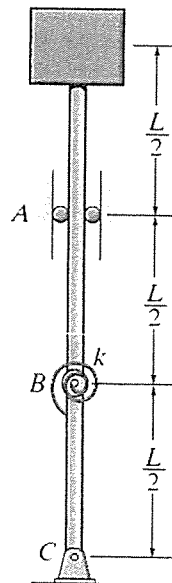


Figure of Prob. 1

2. **20pts** A semi-cylinder of mass m and radius r lies on the rough inclined plane for which $\phi = 10^\circ$ and the coefficient of static friction is $\mu_s = 0.3$. Determine if the semi-cylinder slides down the plane, and if not, find the angle of tip θ of its base AB . Gravitational acceleration $g = 9.81 \text{ m/s}^2$. Draw the Free Body Diagram (FBD) when solving the problem. Failure to do so will result in 8pts deduction. Write your final answer in the form: (Yes or No, if No, then $\theta = \underline{\hspace{2cm}}$)

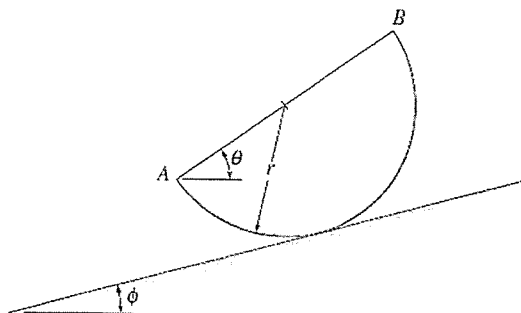


Figure of Prob. 2

(請接背面)

3. **20pts** Determine the horizontal and vertical components of force which the pins at A , B , and C exert on member ABC of the frame. Pin A can freely move on the horizontal plane. Draw the FBD when solving the problem. Failure to do so will result in 8pts deduction. Use Cartesian coordinate for sign convention. Write your final answer in the form: $(A_x, A_y) = (\quad , \quad)$; $(B_x, B_y) = (\quad , \quad)$; $(C_x, C_y) = (\quad , \quad)$.

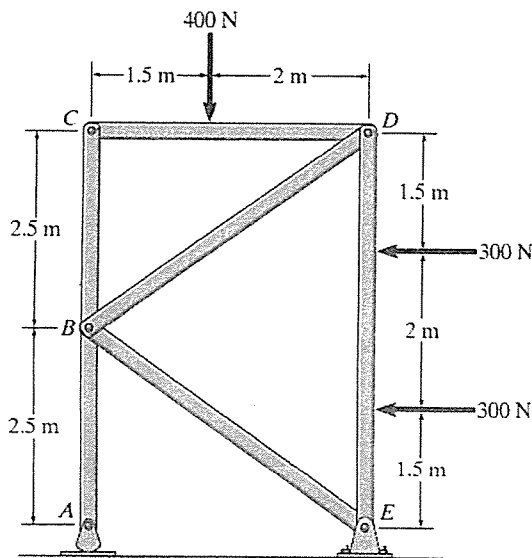


Figure of Prob. 3

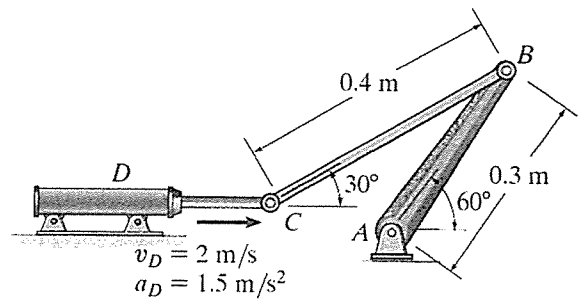


Figure of Prob. 4

4. **20pts** The hydraulic cylinder is extending with the velocity and acceleration shown. Determine the angular acceleration of crank AB and link BC at the instant shown. Write your final answer in the form: $(\alpha_{AB} = \quad \text{Clockwise or Counterclockwise}, \alpha_{BC} = \quad \text{Clockwise or Counterclockwise})$.
5. **20pts** The 75-kg wheel has a radius of gyration about its mass center of $k_G = 375 \text{ mm}$. If it is subjected to a torque of $M = 150 \text{ N} \cdot \text{m}$, determine its angular acceleration. The coefficients of static and kinetic friction between the wheel and the ground are $\mu_s = 0.2$ and $\mu_k = 0.15$, respectively. Write your final answer in the form: $(\alpha = \quad)$.

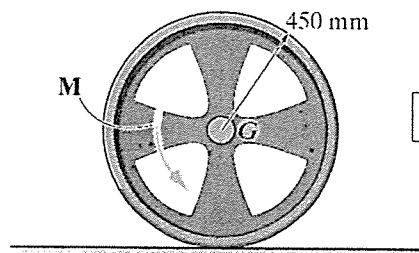


Figure of Prob. 5