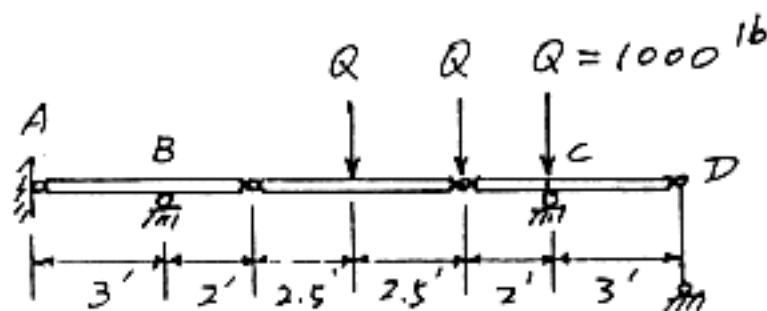
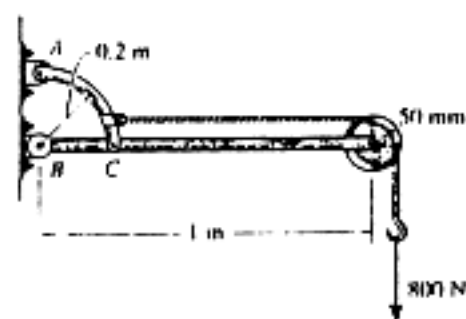


- (25%) 1. Three beams, hinged together at their ends, are supported and loaded as shown below. Determine the reactions at supports A, B, C, and D.



- (25%) 2. Determine the horizontal and vertical components of force that the pins at A, B, and C exert on their connecting members.

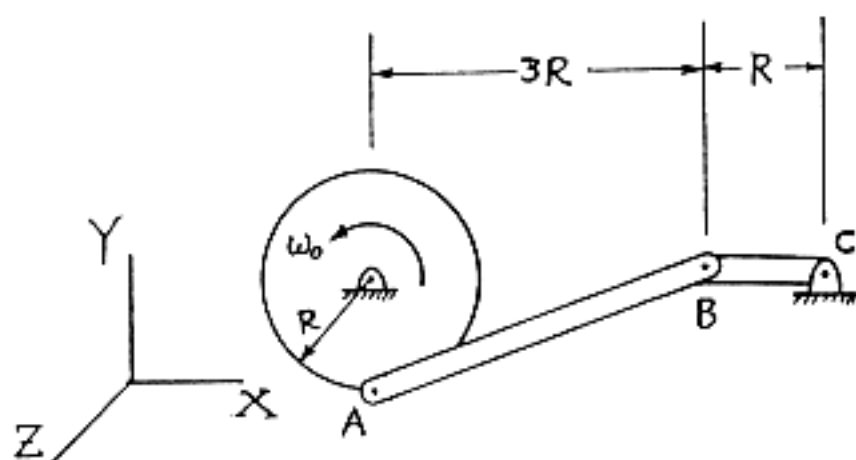


- (25%) 3. For the device shown, the disk is rotating at a constant angular speed ω_0 . Find the angular velocity and angular acceleration of bar AB.
 Given: For two points, a and b , fixed in a rigid body, the relationships of velocities and accelerations between these two points are, respectively:

$$\vec{V}_b = \vec{V}_a + \vec{\omega}_{ab} \times \vec{\rho}_{ab}$$

$$\vec{a}_b = \vec{a}_a + \vec{\dot{\omega}}_{ab} \times \vec{\rho}_{ab} + \vec{\omega}_{ab} \times (\vec{\omega}_{ab} \times \vec{\rho}_{ab})$$

where $\vec{\rho}_{ab}$ is the position vector from a to b ; $\vec{\omega}_{ab}$ and $\vec{\dot{\omega}}_{ab}$ are, respectively, the angular velocity and angular acceleration of the rigid body.



- (25%) 4. A force F acts on block A which rides on identical uniform cylinders B and C , each having a radius R . Block A has mass $2m$. Cylinders B and C have the same mass m . Assume that there is no slipping. (a) What is the speed of A after it moves a distance d ? (b) Find the friction force between cylinder B and the ground.

