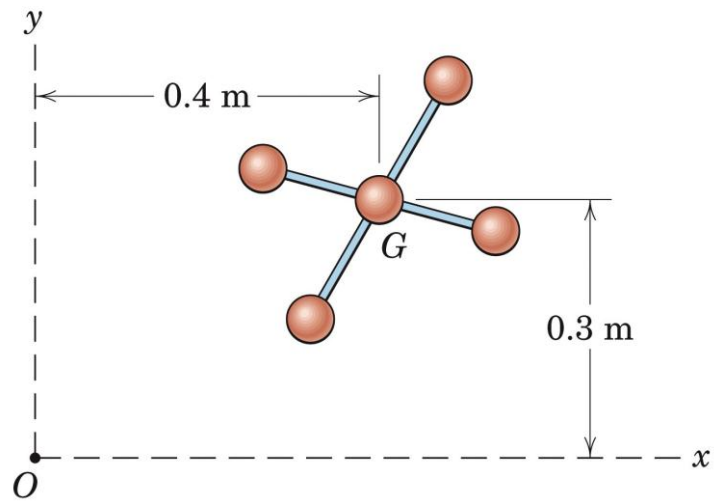


ÇANKAYA UNIVERSITY – MECHANICAL ENGINEERING DEPARTMENT  
ME 204 – DYNAMICS – SPRING 2013  
HOMEWORK 3  
KINETICS OF SYSTEMS OF PARTICLES

Due Date: 3<sup>rd</sup> Lecture Hour of Week 8

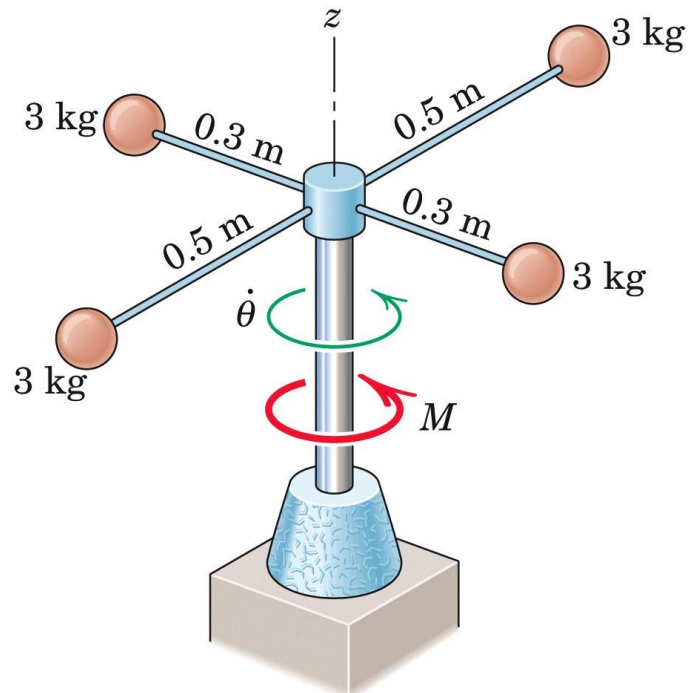
PROBLEM 4/14

Each of the five connected particles has a mass of 0.6 kg, with  $G$  as the center of mass of the system. At a certain instant the angular momentum of the system about  $G$  is  $1.20\mathbf{k}$  kg·m<sup>2</sup>/s, and the  $x$ - and  $y$ -components of the velocity of  $G$  are 3 m/s and 4 m/s, respectively. Calculate the angular momentum  $\mathbf{H}_O$  of the system about  $O$  for this instant.



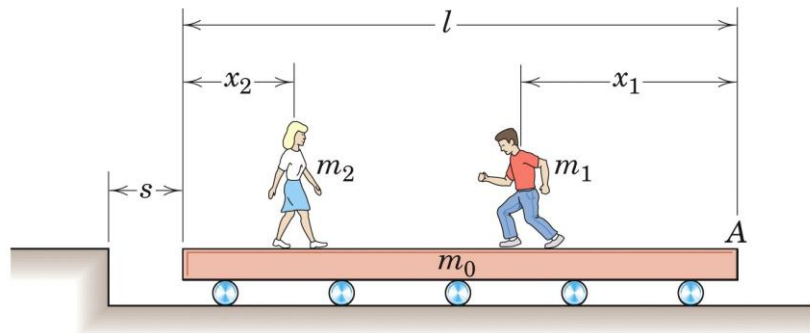
**PROBLEM 4/18**

The four 3-kg balls are rigidly mounted to the rotating frame and shaft, which are initially rotating freely about the vertical  $z$ -axis at the angular rate of 20 rad/s clockwise when viewed from above. If a constant torque  $M = 30 \text{ N}\cdot\text{m}$  is applied to the shaft, calculate the time  $t$  to reverse the direction of rotation and reach an angular velocity  $\dot{\theta} = 20 \text{ rad/s}$  in the same sense as  $M$ .



PROBLEM 4/22

The man of mass  $m_1$  and the woman of mass  $m_2$  are standing on opposite ends of the platform of mass  $m_0$  which moves with negligible friction and is initially at rest with  $s = 0$ . The man and woman begin to approach each other. Derive an expression for the displacement  $s$  of the platform when the two meet in terms of the displacement  $x_1$  of the man relative to the platform.



PROBLEM 4/29

The cars of a roller-coaster ride have a speed of 30 km/h as they pass over the top of the circular track. Neglect any friction and calculate their speed  $v$  when they reach the horizontal bottom position. At the top position, the radius of the circular path of their mass centers is 18 m, and all six cars have the same mass.

