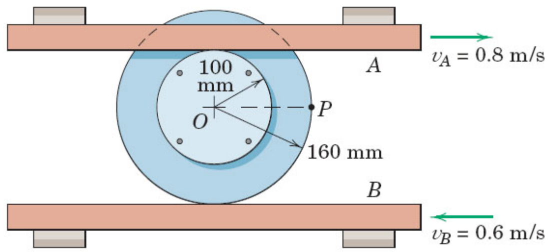
Department of Mechanical Engineering
University of California at Berkeley
ME 104 Engineering Mechanics II
Spring Semester 2010

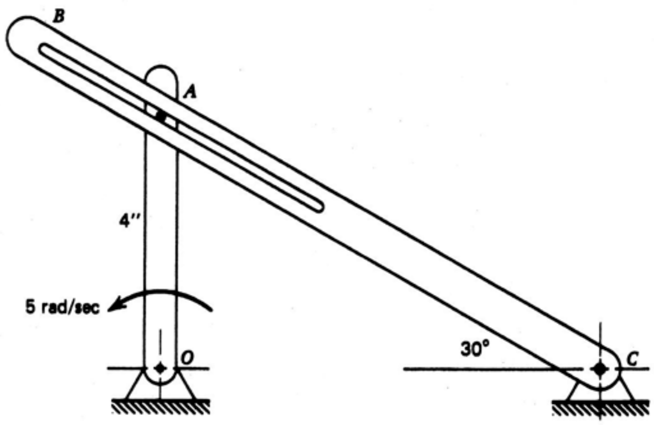
Instructor: F. Ma
Final Examination May 11, 2010

The examination has a duration of 2 hours and 45 minutes.
Answer all questions.
All questions carry the same weight.

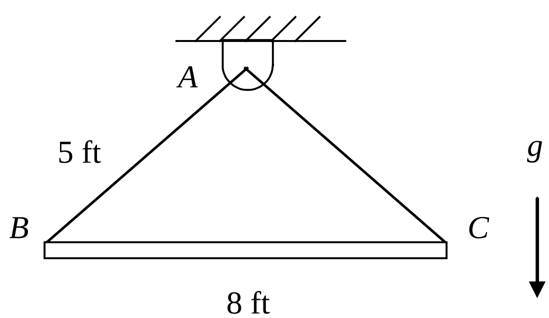
1. Each of the sliding bars *A* and *B* engages its respective rim of the two riveted wheels without slipping. If, in addition to the information shown, bar *A* has an acceleration of 2 m/s^2 to the right and there is no acceleration of bar *B*, calculate the magnitude of the acceleration of point *P* for the instant depicted.



2. The crank *OA* revolves counterclockwise with a constant angular velocity of 5 rad/s. For the position shown, determine the angular velocity and angular acceleration of the slotted link *BC*.

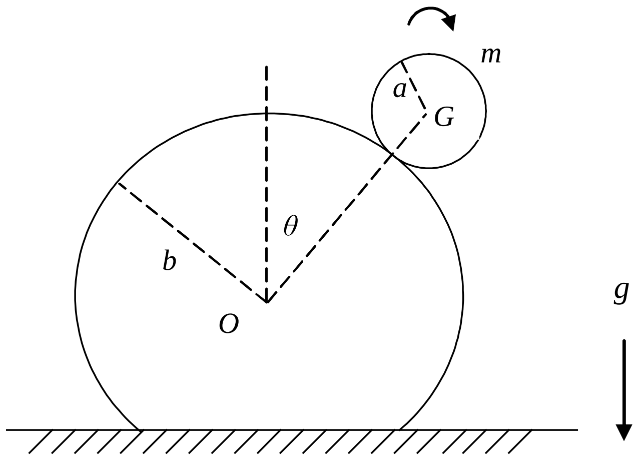


3. The slender 150-lb bar is supported by two identical cords *AB* and *AC*. If cord *AC* suddenly breaks, determine the initial angular acceleration of the bar and the tension in cord *AB*.



4. A sphere of mass *m* and radius *a* rests on top of a larger fixed sphere of radius *b*. The smaller sphere is slightly displaced so that it rolls without slipping down the larger sphere. Where will the rolling sphere leave the fixed sphere? Is there any change in the take-off position if two cylinders of radii *a* and *b* are used instead? The moment of inertia of a sphere of mass *m* and radius *r* about a diameter is $2mr^2/5$. The moment of inertia of a cylinder of mass *m* and

radius r about its axis is $mr^2/2$.



5. Determine the minimum velocity v which the wheel must have to just roll over the obstruction. The centroidal radius of gyration of the wheel is k, and it is assumed that the wheel does not slip. What is the value of v if the wheel is a uniform disk with mass m and radius r and $h = r/8$?