

**MECH 211****Fall 2006****Test 2**

Due at 9:00 a.m. November 8, 2006.

Show all work. Draw free body diagrams where appropriate (i.e. when using $\mathbf{F} = m\mathbf{a}$ methods). Clearly indicate final answers.

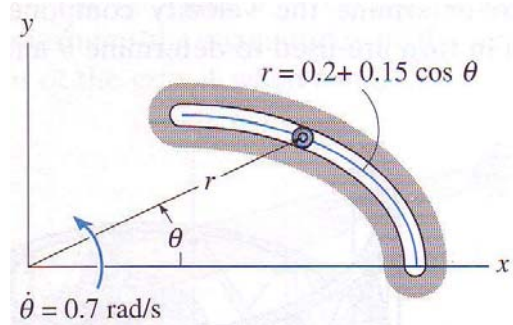
This test is taken under the Rice Honor Code system. You may consult only the textbook (Bedford and Fowler), notes that you have personally taken, and any material downloaded from the course website. You may use a calculator, including programmable calculators. The test must be taken during a 3 hour period, with an optional 30 minute break.

Time started: _____

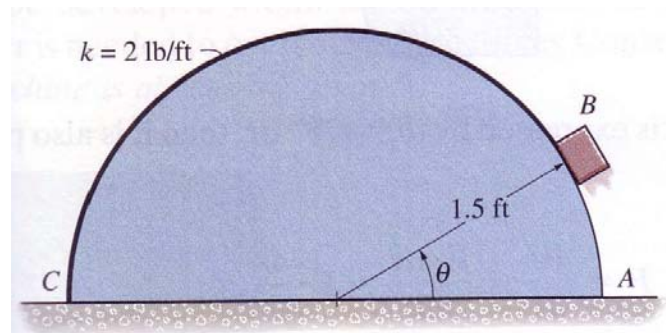
Time finished: _____

Pledge: _____

1. The pin follows the path described by the equation $r = (0.2 + 0.15 \cos \theta)$ m. At the instant $\theta = 30^\circ$, $\dot{\theta} = 0.7$ rad/s and $\ddot{\theta} = 0.5$ rad/s². Determine the pin's velocity and acceleration in both Cartesian and polar coordinates. (10 points)



2. A 2-lb block rests on the frictionless semicylindrical surface. An elastic cord having a stiffness $k = 2$ lb/ft is attached to the block at B and to the base of the semicylinder at point C . If the block is released from rest at A ($\theta = 0^\circ$), determine the unstretched length of the cord so the block begins to leave the semicylinder at the instant $\theta = 45^\circ$. Neglect the size of the block. (20 points)



3. To test the manufactured properties of 2-lb steel balls, each ball is released from rest as shown and strikes a 45° inclined surface. If the coefficient of restitution is to be $e = 0.8$, determine the distance s to where the ball must strike the horizontal plane at A . At what speed does the ball strike A . (20 points)

