KING SAUD UNIVERSITY
College of Engineering
Mechanical Engineering Department

Final Exam

GE 202 DYNAMICS (Duration of exam: 3 hours) **29 /12 / 2012**

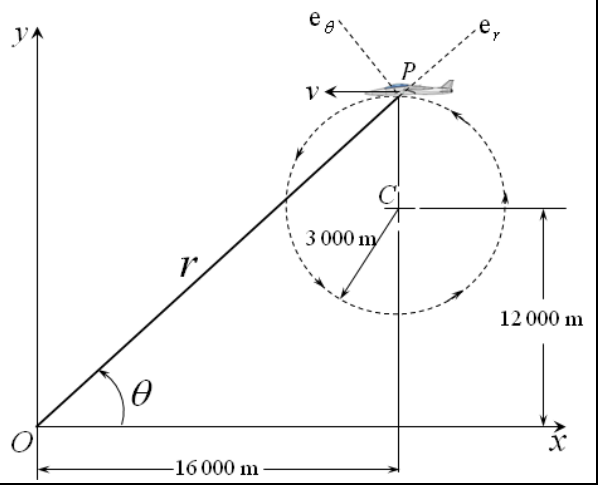
Problem 1

The aircraft *P* is traveling at a constant speed of $v = 100$ m/s in the circle of radius 3000 m. For the instant shown determine the quantities:

r=?, θ = ?, $\dot{r}$=?, $\dot{\theta}$ = ?, $\ddot{r}$=?, $\ddot{\theta}$ = ?

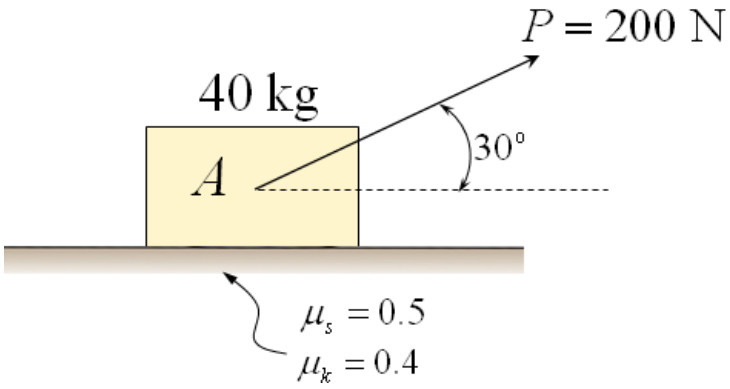
Note: $v_r = \dot{r}$, $v_\theta = r\dot{\theta}$

$a_r = \ddot{r} - r(\dot{\theta})^2$, $a_\theta = r\ddot{\theta} + 2\dot{r}\dot{\theta}$



Problem 2

Compute the acceleration of block *A* for the instant shown?



Problem 3

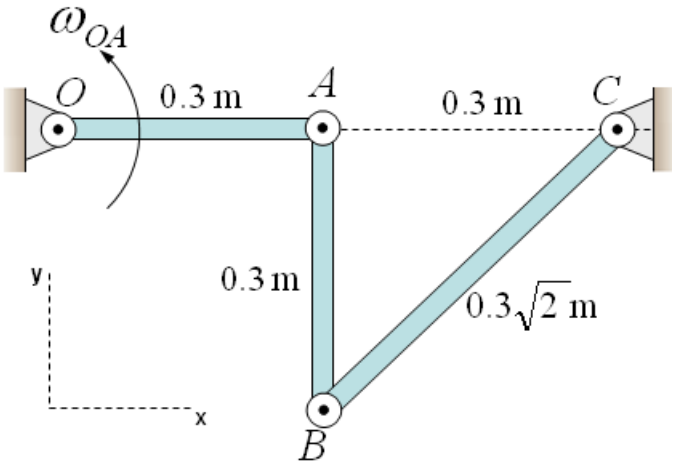
Link *OA* has a constant counter clockwise angular velocity $\omega_{OA} = 4\ rad/s$ during a short interval of its motion. For the position shown determine:

a) The angular velocity ω_{AB} of link *AB*?

b) The angular velocity ω_{BC} of link *BC*?

c) The angular acceleration α_{AB} of link *AB*?

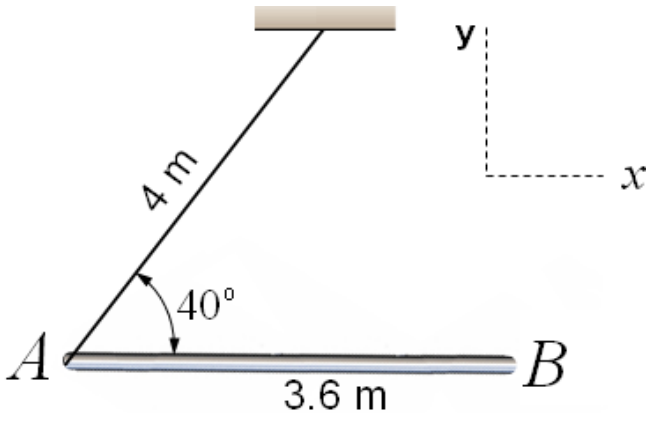
d) The angular acceleration α_{BC} of link *BC*?



Problem 4

The uniform 50 kg bar *AB* is supported by a cable at *A*. Immediately after the bar is released from rest in the position shown:

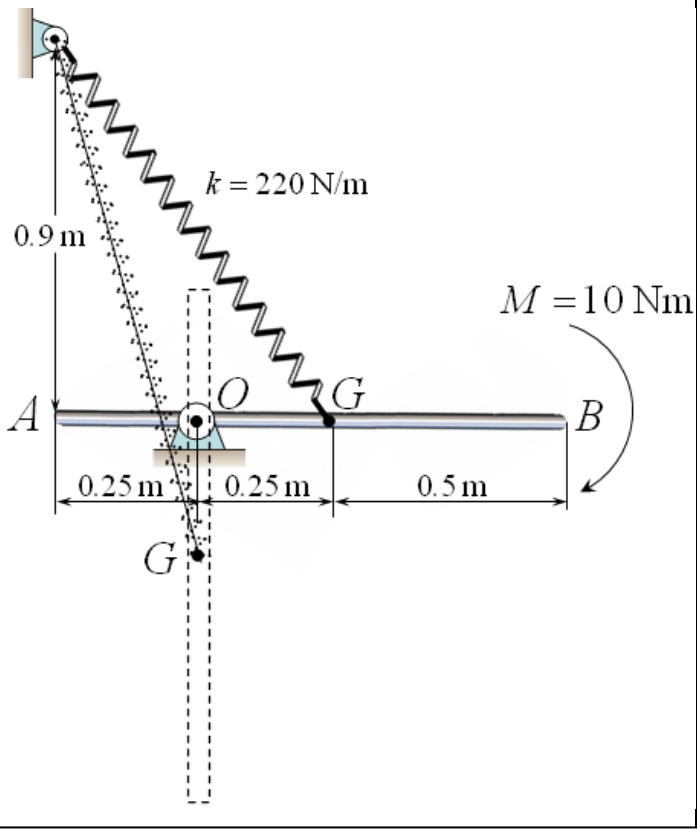
a) Draw the Free body and Kinetics diagrams.
b) Determine **t**he angular acceleration of the bar, $\alpha = ?$
c) Determine the tension in the cable, $T = ?$



Given: $I_G = \frac{1}{12} m\ L^2$, where *m* is the mass and *L* is the length of the bar.

Problem 5

The 4 kg uniform slender rod *AB* rotates in the vertical plane about a pin at *O*. The spring attached to the rod at *G* has a stiffness of 220 N/m, and its unstretched length is 0.6 m. The rod is released from rest in the position shown. Determine the angular velocity of the rod in the vertical position, $\omega = ?$ when a constant couple moment $M = 10$ Nm is applied to the end *B*.



Note: $I_G = \frac{1}{12} m\ L^2$, where *m* is the mass and *L* is the length of the slender rod.

GOOD LUCK