

KING SAUD UNIVERSITY
College of Engineering
Mechanical Engineering Department

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

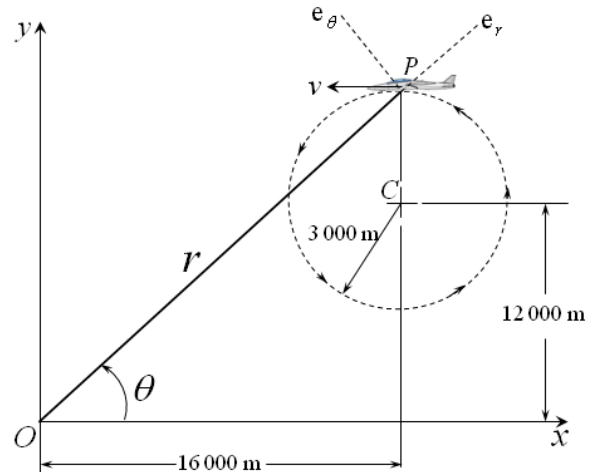
Problem 1

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

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

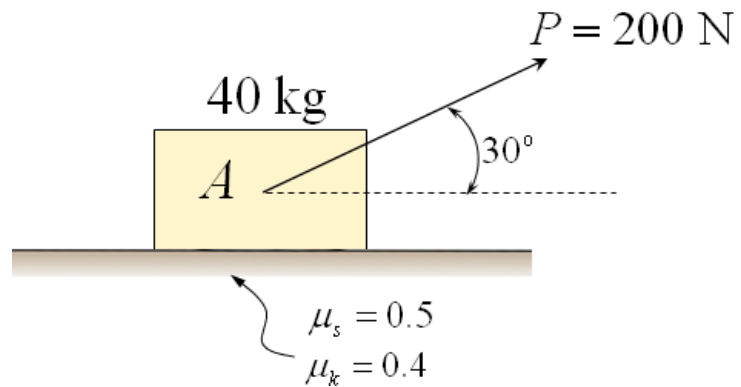
Note: $v_r = \dot{r}$, $v_\theta = r\dot{\theta}$

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



Problem 2

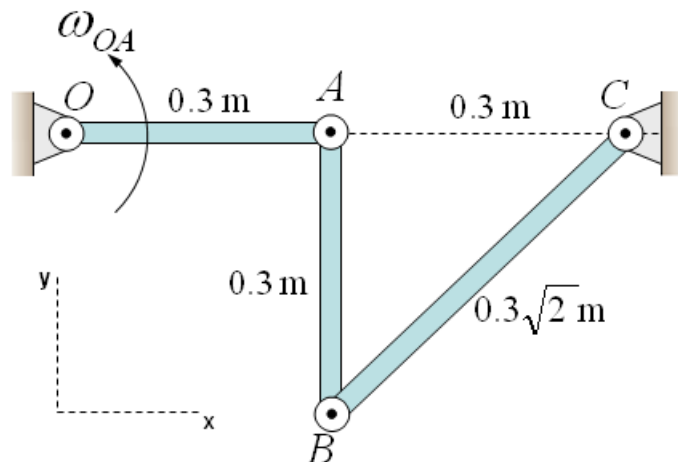
Compute the acceleration of block A for the instant shown?



Problem 3

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

- The angular velocity ω_{AB} of link AB ?
- The angular velocity ω_{BC} of link BC ?
- The angular acceleration α_{AB} of link AB ?
- The angular acceleration α_{BC} of link BC ?

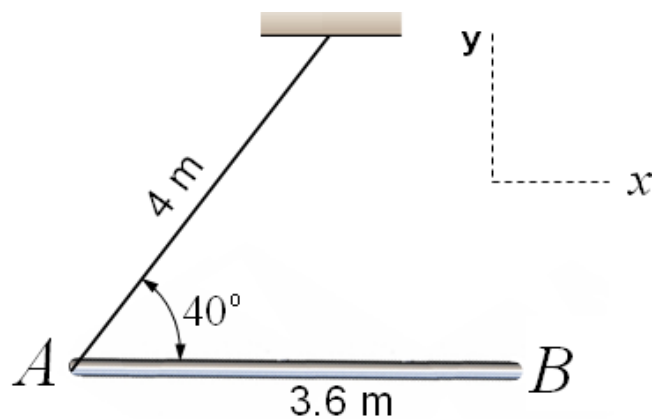


Problem 4

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:

- Draw the Free body and Kinetics diagrams.
- Determine the angular acceleration of the bar, $\alpha = ?$
- Determine the tension in the cable, $T = ?$

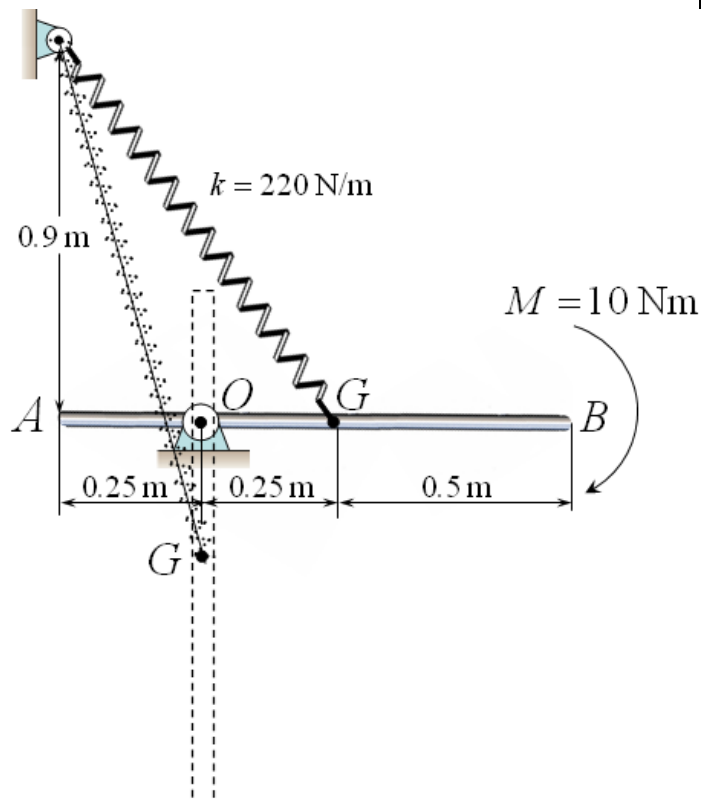
Given: $I_G = \frac{1}{12} m L^2$, where m is the mass and L is the length of the bar.



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 $M = 10\text{ Nm}$ 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.



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