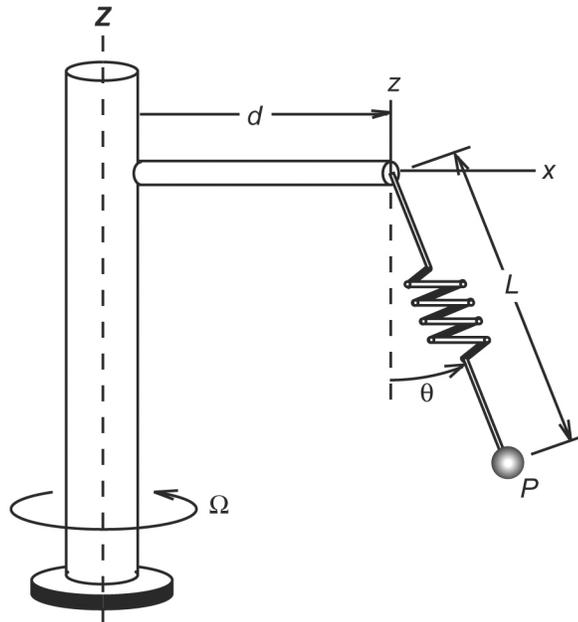


## 16.61 Homework Assignment #3

On these problems, clearly define the frames you are using, the angles between the frames, and the rates of these angles (as necessary). Be very clear and consistent on your vector and matrix notation. It will not be possible to get full marks on these questions if your approach is not systematic and clear.

1. A spring pendulum is attached to a rotating shaft by an arm (length  $d = 0.8\text{m}$ ), as shown in the figure. At the instant shown, the shaft is rotating with the constant angular velocity  $\Omega = 0.4 \text{ rad/sec}$ ,  $\theta = 30^\circ$ ,  $\dot{\theta} = 0.3 \text{ rad/sec}$  and  $\ddot{\theta} = 2 \text{ rad/sec}^2$ . The pendulum length is  $L = 1.3\text{m}$  and it is currently getting shorter at the constant rate  $0.1\text{m/s}$ .



Find the acceleration of the tip of the pendulum (point  $P$ ). Remember - focus on the FARM (frame selection, angles, angular rates, and matrix formulation).