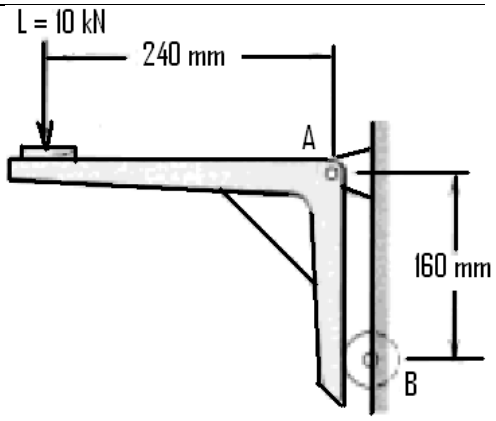
KING SAUD UNIVERSITY
Mechanical Engineering Department
GE 210: Engineering Mechanics

2nd Term 1427-1428
Final Exam
Time: 3 hours

Solve the following problems:

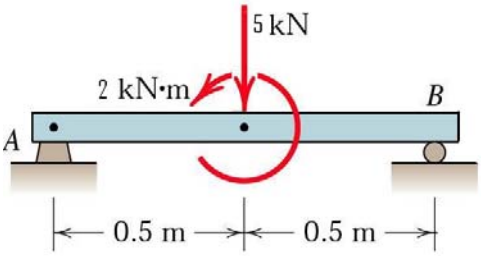
1- The bracket shown in the figure is loaded by a load L=10 kN and supported by pin support at A and Roller support at B.

- Draw FBD
- Find Reaction at A
- Find Reaction at B



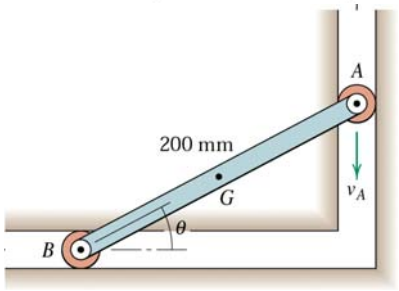
2- For the shown loaded beam;

a) Determine the reactions at A and B
b) Derive expressions for the shear force V and the bending moment M as function of x along the beam.
c) Draw the shear and the moment diagrams.



3- If end A of the constrained link AB has a **constant velocity** V_A=2 m/s as the bar passes the position for which θ = 30°, determine:

- Velocity and acceleration of point B
- Angular velocity and acceleration of bar AB.



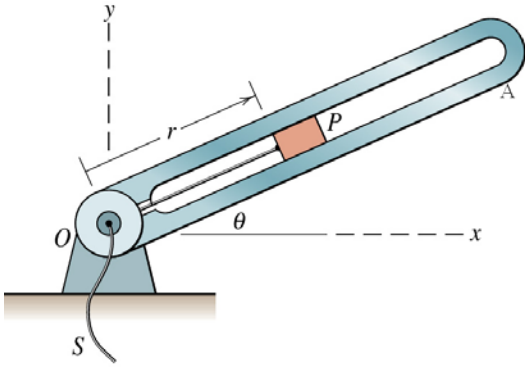
4- Referring to the figure, the angular motion of arm OA about pivot O is described by: $\theta = 0.8\,t + t^2/20$. At the same time, block P slides inside the longitudinal slot according to: $r = 1.6 + 0.2\,t$. Units are: t[s], θ[rad] and r[m]. For $t = 2$ s, find:

a) The magnitude v of the velocity vector and the magnitude a of the acceleration vector of slider P.
b) The angles ϕ_v and ϕ_a the velocity and acceleration vectors, respectively, make with the radial direction.

Given:

$$v_r = \dot{r}, \qquad v_\theta = r\dot{\theta}$$

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



5- The uniform 20 kg slender bar is released from rest in the horizontal position. Calculate:

- Initial angular acceleration
- Reaction force at O.