ES2501: Introduction to Static Systems

Name:_____ **Quiz 7**

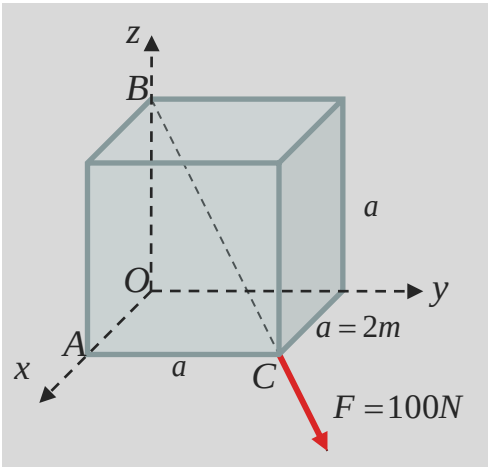
Your solution should include necessary **free-body diagrams and static equilibrium equations**. Please circle your final answers.

1. A force of 100N is applied on a cube along its diagonal BC at corner C, as shown.

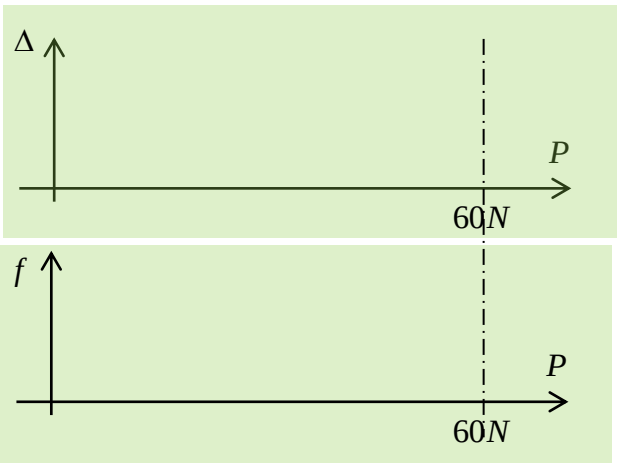
   a. Find the Cartesian vector form of the force.

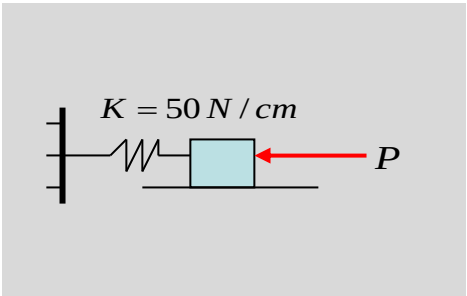
   b. Find the moment of the force above about A.

   c. Find the moment of the force above about OA.

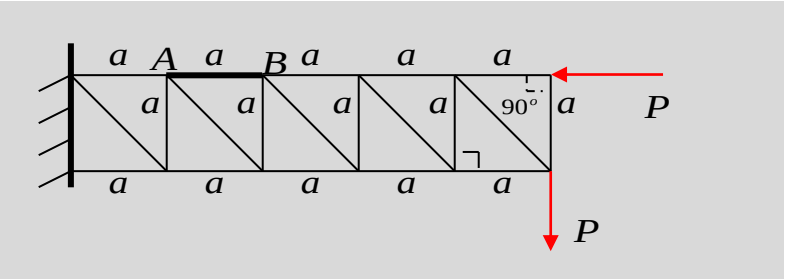


2. A block of weight of 100N is placed on a rough ground and is connected to a fixed wall by a linear spring. The spring is initially un-stretched and the spring constant K=50N/cm A horizontal force of P is slowly applied on the block. Assume that the static friction coefficient are 0.3. Plot a curve of *f* (friction force) vs. P and a curve of Δ (compression of the spring) vs. P, respectively. Assume that P in linearly increased from 0 to 60N.





3. Find the internal force in bar AB in the truss shown. Assume that all bars are pin-connected and weight of the truss is ignored. Indicate whether the bar is under tension or compression.



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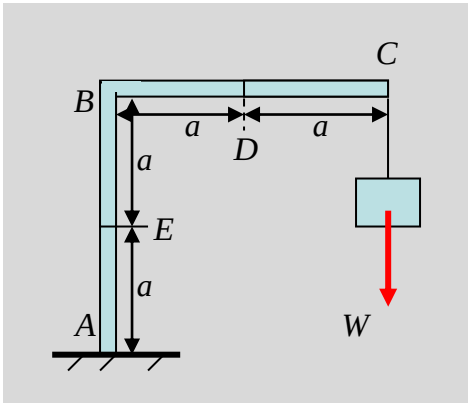
4. A crane *ABC*, treated as **one piece** of rigid body, hangs a weight of *W*. Assume that both segments AB and BC are uniform and their weight per unit length is γ. Neglect the lateral size of each segment and treat them as a line segment. Note that BC is horizontal and AB is perpendicular to BC. Find the internal forces of the crane at points *D* and *E*, respectively.



5. Find the moment of inertia of the T-cross section area about it two principal axes. Take $a = 10cm \quad b = 2cm$.
(Hint: What are the principal axes of a cross section?)