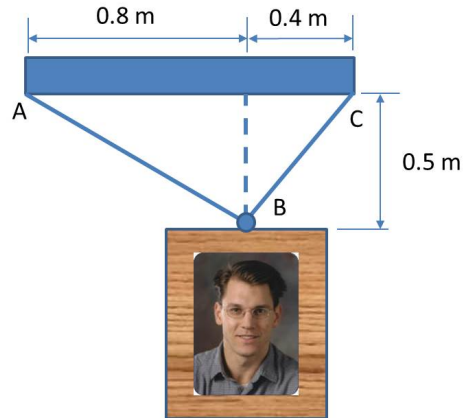
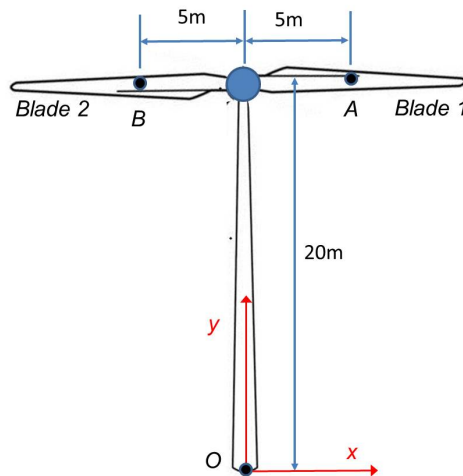


You may only use a simple calculator that does not communicate in any wireless manner. Pagers, cell phones, and all other communications devices must be turned off during the quiz.

1. (32points) Prof. Seiler hung a picture in his office. The frame is suspended by two cables as shown below. The combined mass of the picture and frame is 2kg. Determine the tension in cables AC and BC.



2. A two-bladed wind turbine is shown in the figure below. A right-handed coordinate system is shown with origin O at the base of the turbine tower. The wind applies thrust forces  $\mathbf{F}_A = -10000\mathbf{k}$  N at point A and  $\mathbf{F}_B = -10000\mathbf{k}$  N at point B.



- (A) [13pts] What is the moment about O due to the force  $\mathbf{F}_A$ ?
- (B) [13pts] What is the moment about O due to the force  $\mathbf{F}_B$ ?
- (C) [13pts] Assume the turbine is in static equilibrium. What is the reaction moment applied by the ground on the turbine tower? For simplicity you may neglect any gravitational forces.
- (D) [5pts] An engineer would like to build a new, larger turbine to increase the generated power. Assume that all dimensions of the new turbine are three times as large as the old turbine. Also assume the thrust forces are twice as large on the new turbine. If the new turbine is in static equilibrium then what is the reaction moment applied by the ground on the turbine tower?

3. (24points) The bar shown in Figure 1 below has forces acting at various points on the right and one couple of magnitude  $10\text{Nm}$  acting on the left. Assume the bar is in static equilibrium. The dots denote equally spaced points on the bar.

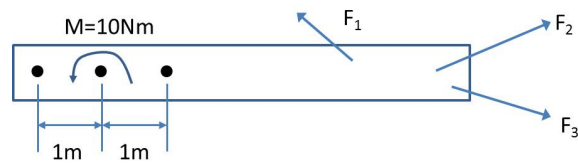
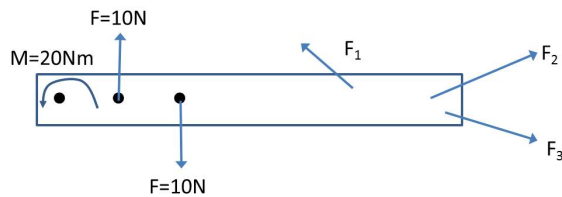
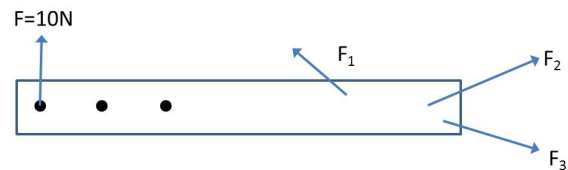


Figure 1: Bar in static equilibrium

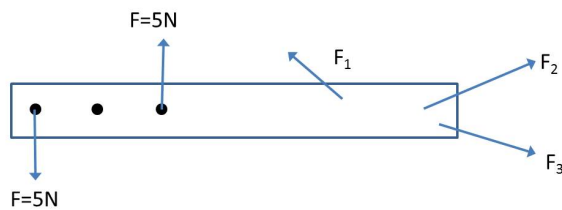
Which of the following load(s) still maintain static equilibrium? Briefly justify your answer for each case.



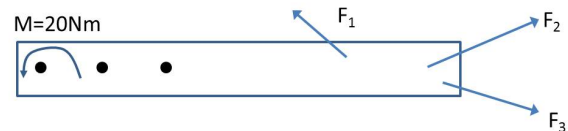
(a)



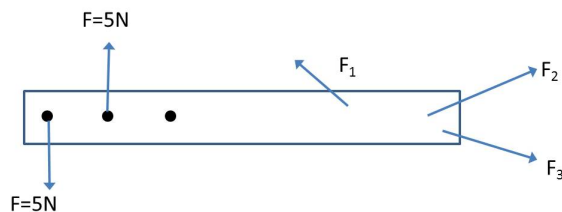
(b)



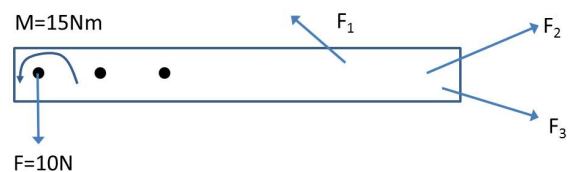
(c)



(d)



(e)



(f)