ME 201 STATICS

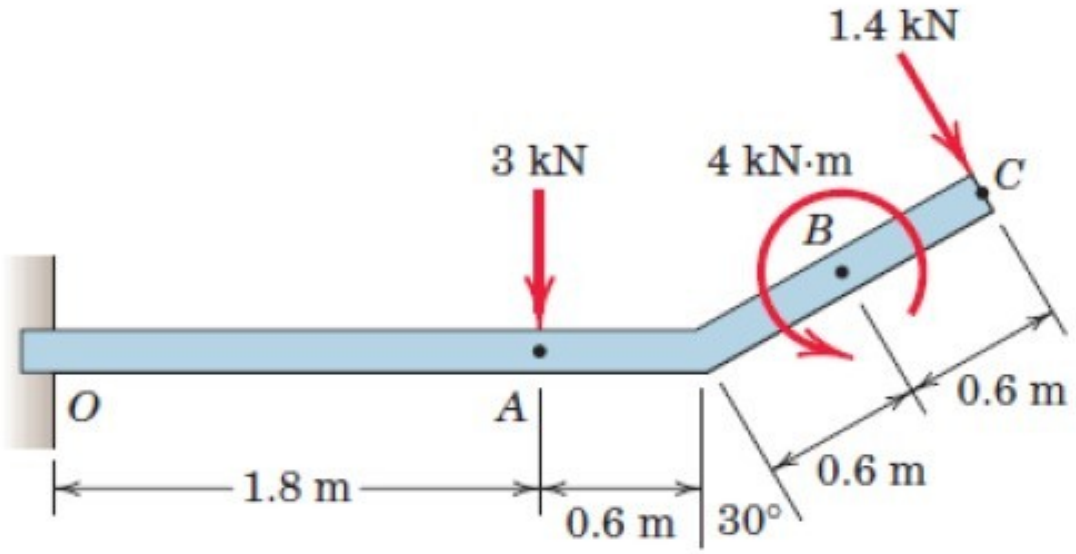
PROBLEM HOUR III

2D EQUILIBRIUM

Q1)

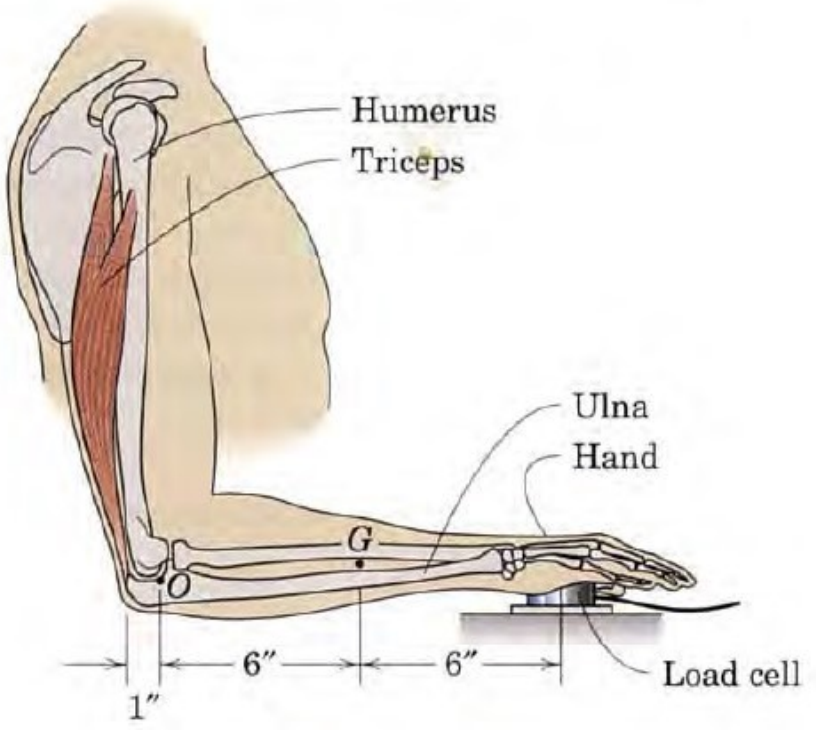
The uniform beam has a mass of 50 kg per meter of length. Compute the reactions at the support O. The force loads shown lie in a vertical plane.

Ans. $O_x = -0.7$ kN, $O_y = 5.98$ kN, $M_O = 9.12$ kN·m

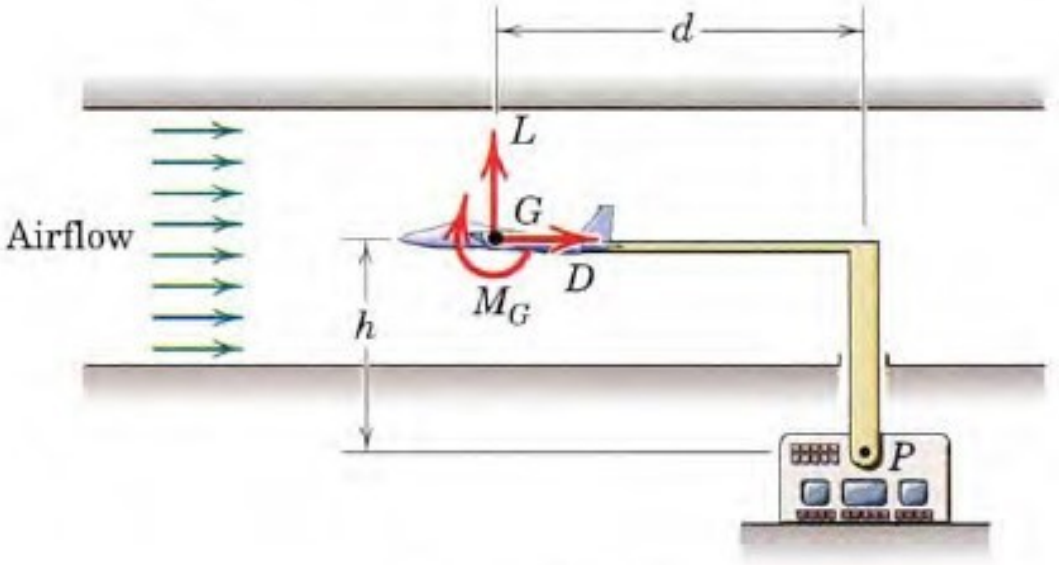


Q2) In a procedure to evaluate the strength of the triceps muscle, a person pushes down on a load cell with the palm of his hand as indicated in the figure. If the load-cell reading is 35 lb, determine the vertical tensile force F generated by the triceps muscle. The lower arm weighs 3.2 lb with mass center at G. State any assumptions.

Ans. $F = 401$ lb

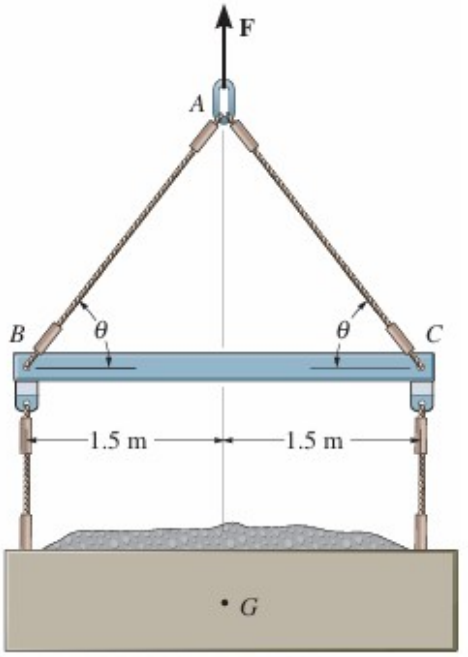


Q3) To test the validity of aerodynamic assumptions made in the design of the aircraft, its model is being tested in a wind tunnel. The support bracket is connected to a force and moment balance, which is zeroed when there is no airflow. Under test conditions, the lift L, drag D, and pitching moment M_G act as shown. The force balance records the lift, drag, and a moment M_P. Determine M_G in terms of L, D, and M_P.

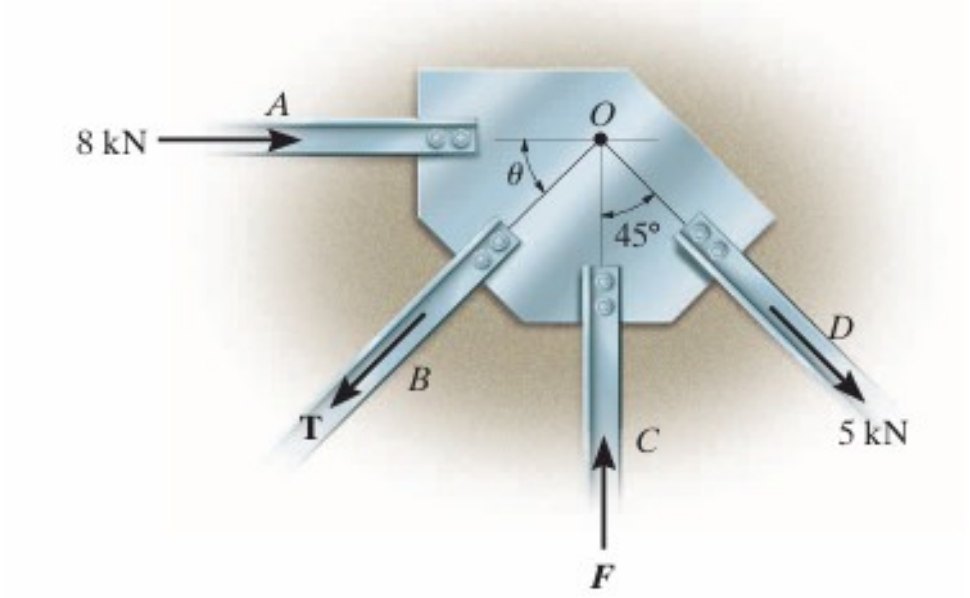


Q4)

The lift sling is used to hoist a container having a mass of 500 kg. Determine the force in each of the cables AB and AC as a function of θ. If the maximum tension allowed in each cable is 5 kN, determine the shortest lengths of cables AB and AC that can be used for the lift. The center of gravity of the container is located at G.



Q5) The gusset plate is subjected to the forces of four members. Determine the force in member B and its proper orientation θ for equilibrium. The forces are concurrent at point O. Take $F = 12$ kN.



Q6)

As the result of a wind blowing normal to the plane of the rectangular sign, a uniform pressure of 175 N/m^2 is exerted in the direction shown in the figure. Determine the moment of the resulting force about point *O*. Express your result as a vector using the coordinates shown.