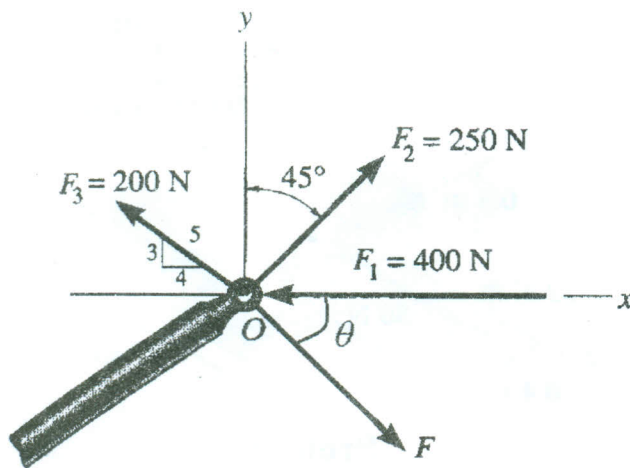


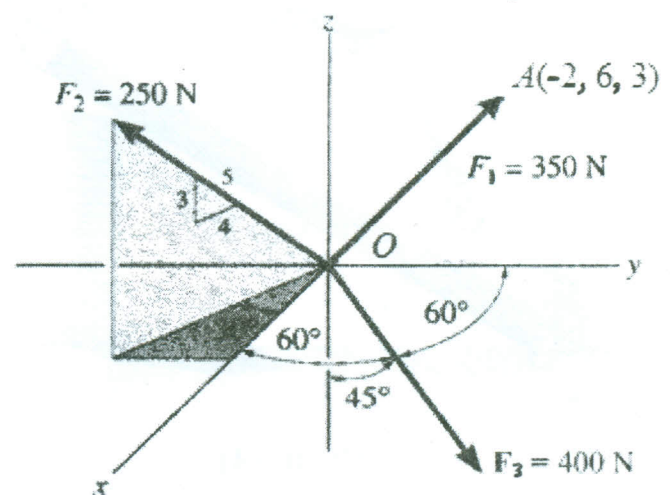


Exam Guidelines: This Exam contains 6 questions in 2 pages, start every question in a new page.

- (1) [10 pt.] Determine the magnitude of the force F and its direction angle θ so that the four forces shown are in equilibrium.
- (2) [15 pt.] Determine the magnitude and direction angles of a force F to be added to the system to get a resultant of magnitude 900 N and parallel to the vector $L = 6\mathbf{i} + 6\mathbf{j} - 3\mathbf{k}$.

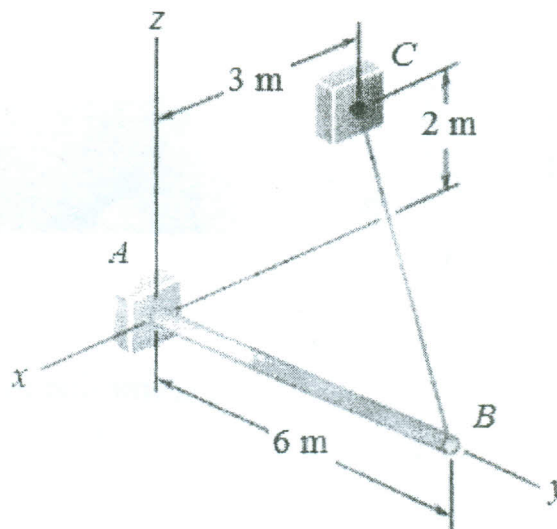


Prob. (1)



Prob. (2)

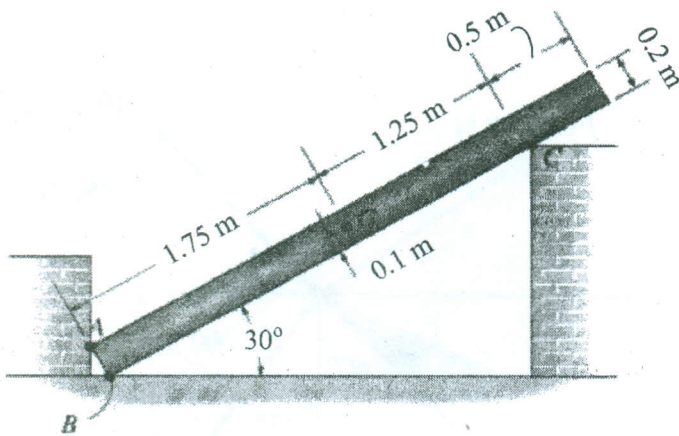
- (3) [15 pt.] The tension in the cable BC applied at B is 700 N. Determine the moment of the tension force about: **i)** point A , and **ii)** the line joining the two points $D(4, 3, 0)$ m and $E(0, 5, 4)$ m from D to E . Also, determine the force acts at A which with the tension constitute a couple and determine the moment of this couple.



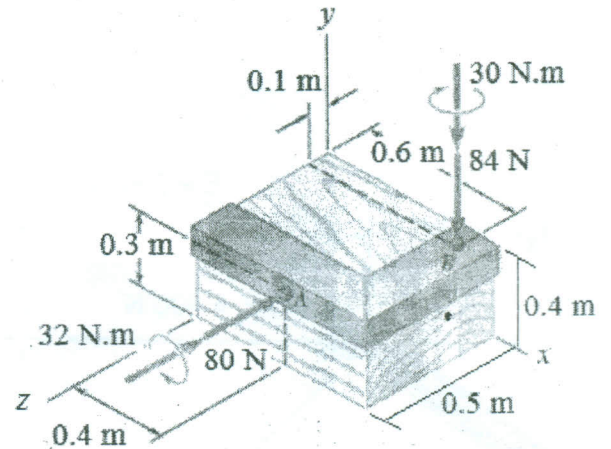
Prob. (3)

(4) [15 pt.] The uniform bar has mass 100 kg and center of mass at G . The supports A , B , and C are smooth. Determine the reactions at the points of contact at A , B , and C .

(5) [20 pt.] The forces and couples shown are applied to two screws as a piece of sheet metal is fastened to a block of wood. Replace the force system shown by an equivalent force-couple system acting at the point O . Then reduce them to an equivalent wrench and determine the point where the axis of the wrench intersects the xz plane.

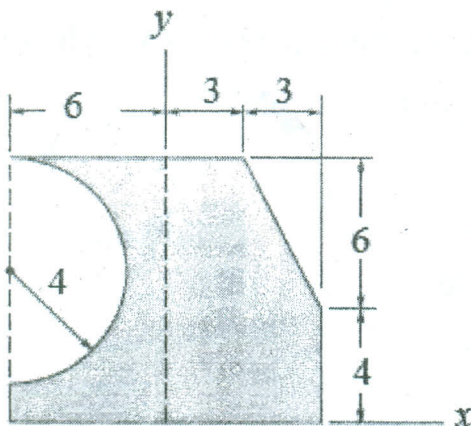


Prob. (4)



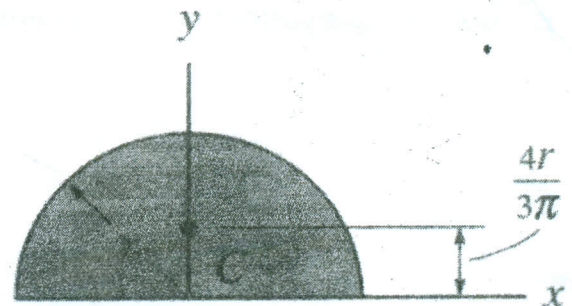
Prob. (5)

(6) [15 pt.] Determine the location of the centroid of the shaded area shown in figure. Also, determine the volume of the surface of revolution generated by revolving the shaded area about x axis by an angle equals 180° .



Dimensions in m

Prob. (6)



Centroide of Semicircular area