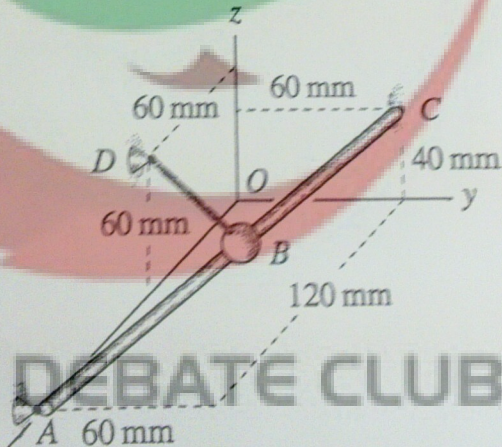


**PROBLEM 1:** (30 points)

Bead  $B$  has negligible weight and slides without friction on rigid fixed bar  $AC$ . An elastic cord  $BD$  which supports a 60 N tensile force is attached to the bead. At the instant shown, the bead has zero velocity and is positioned between points  $A$  and  $C$  such that  $AB = \frac{3}{4} AC$ . Determine the components of the cord tension that act parallel and perpendicular to direction  $AC$  of the bar. Express the result as Cartesian vector.



THE DEBATE CLUB



CEN 201 – CEN 202

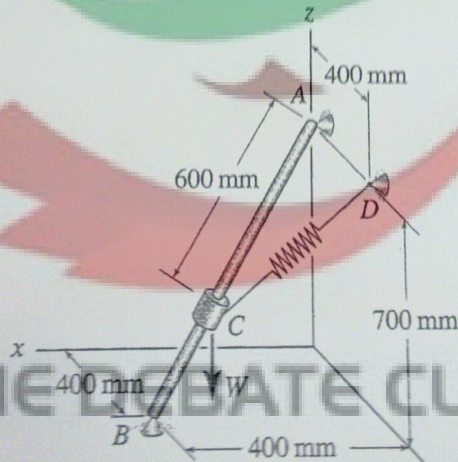
Spring 2011 – Exam 1

5 / 9

**PROBLEM 2:** (40 points)

Rod  $AB$  is fixed in the space. Spring  $CD$  has a stiffness  $k = 1.5 \text{ N/mm}$  and an unstretched length of 400 mm. If there is no friction between the collar and the rod, determine the weight  $W$  of the collar that produces the equilibrium configuration shown, and the perpendicular reaction  $\vec{N}$  to the rod  $AB$  acting on the collar.

**N.B.:** the order by which  $W$  and  $\vec{N}$  are calculated is not important.





**PROBLEM 3:** (30 points)

A door with rectangular shape is hinged along an axis having direction  $a$  lying in  $z$ - $x$  plane. The door is supported by a cable that has a tensile force  $F = 90$  N. Determine the moment of  $F$  about line  $a$ .

Express the result as a Cartesian vector.

