



**GNG 1105 - ENGINEERING MECHANICS**

Final Examination  
9 December 2009

Time: 3 hours  
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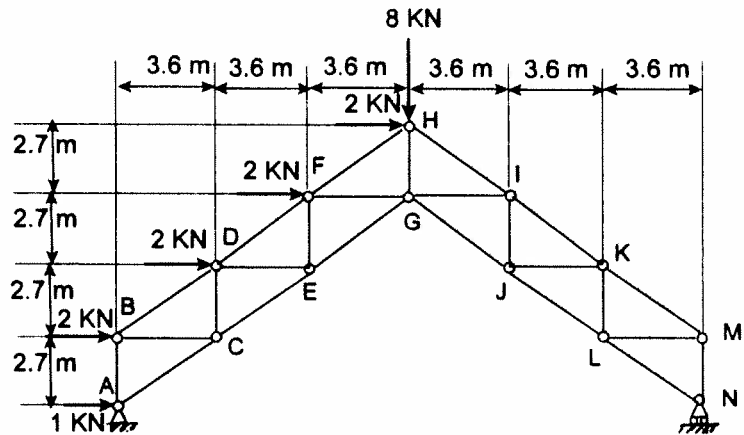
Profs. Skaff and Van Blaeren

**Closed Book.** Programmable calculators are not allowed.  
Free-body diagrams must be drawn wherever appropriate.

1 - (12 marks)

The accompanied truss is loaded as shown. All joints are pinned.

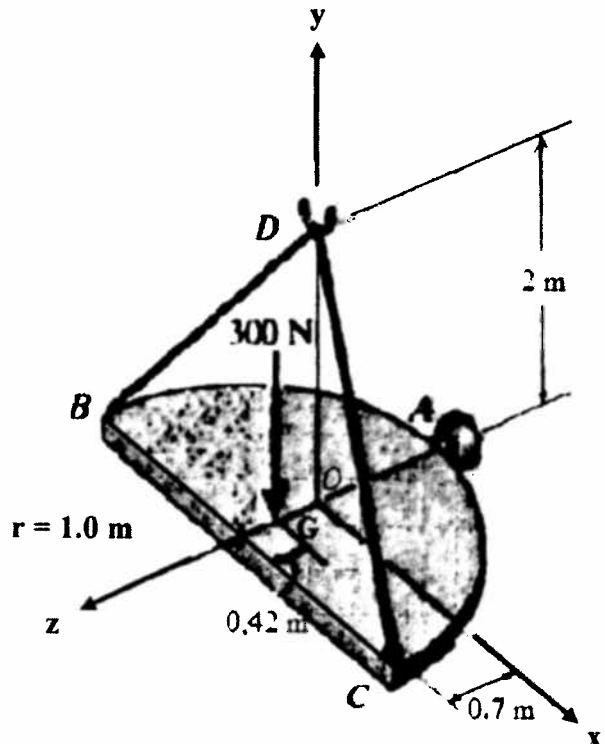
- Calculate the reactions at the supports A and N.
- Using the method of sections, determine the forces in members DF, DE and CE. State whether each member is in tension or compression. If you used the method of joints, you will get a mark of zero for this part.



2 - (12 marks)

A semi-circular horizontal plate is being held in equilibrium by a ball and socket joint at point A and by two cables at points B and C. These two cables are attached to point D which is located above the plate and lies on the y axis. The weight of the plate is 300N which is acting at its centroid G as shown in the diagram.

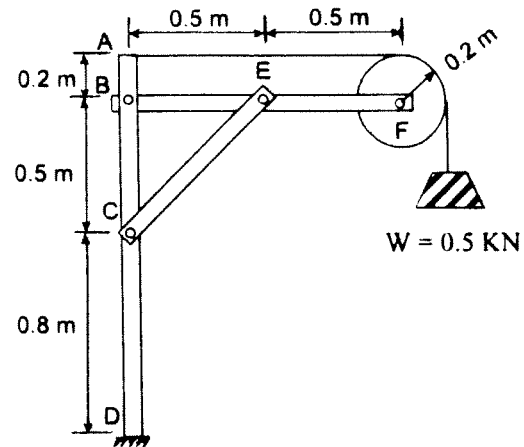
- Draw the free body diagram of the plate.
- Write, in vector form, the tension in cables BD, CD and the 300N weight.
- Calculate the tension in each of the two cables BD and CD and the components of the reaction at point A.



3 - (12 marks)

Consider the frame to the right. Joints B, E and C are pinned.

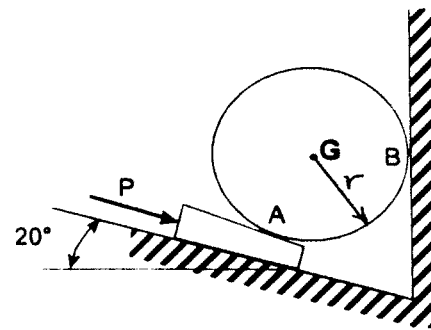
- Find the components of the reaction at the fixed support D.
- Calculate the components of the forces at joints B, C and E.



4 - (12 marks)

A  $10^\circ$  wedge is forced under an 80-Kg cylinder as shown.

Knowing that the coefficient of static friction at all surfaces is 0.25, determine the value of the force P for which the motion of the wedge is impending.



5 - (12 marks)

A brick of mass,  $m = 1 \text{ Kg}$ , is thrown from point O, which is the origin of the xy axes shown in the diagram, with an initial velocity  $V_0$  equal to  $6.0 \text{ m/s}$  and makes an angle of  $\theta$  with the horizontal axis.

a) What would be the value of angle  $\theta$  for the brick to reach point A which is  $1.0\text{m}$  above the horizontal axis knowing that its vertical velocity at A will be zero? A is located at the edge of a horizontal platform as shown in the diagram.

b) After the brick hits the platform, it will slide and finally it will stop at point B. Find how far point B is from point A and how much time the brick will take to travel from point B to A. The coefficient of kinetic friction between the brick and the platform is 0.2.

