Concordia UNIVERSITY

Faculty of Engineering and Computer Science

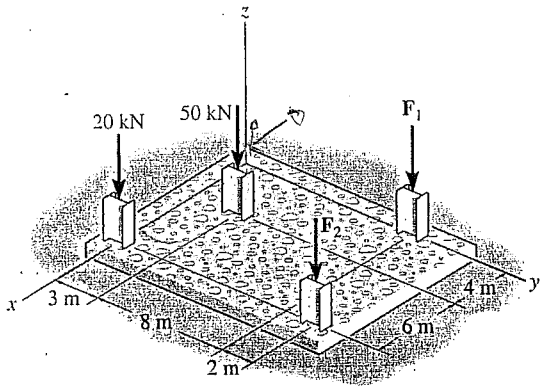
FINAL EXAMINATION ENGR 242/2 Statics Sections: T,V,X,YY **Date:** December 14, 2002

Instructors: Professors Dargahi, Rivard, Sabour, Stathopoulos (coordinator)

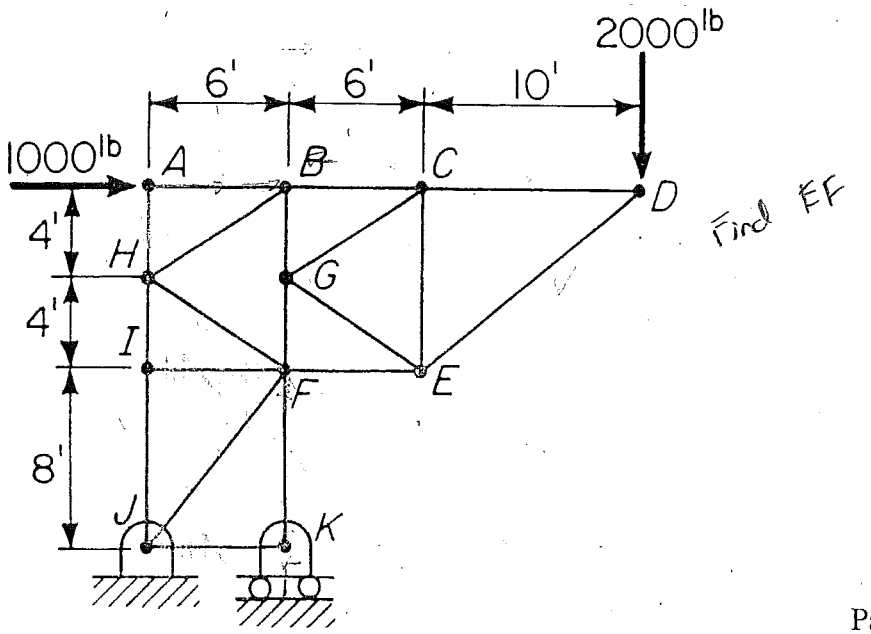
Materials allowed: Non-programmable calculators **Time allowed**: 3 hours

Special instructions: Problems carry equal weights. Solve any FIVE of the given 6 problems.

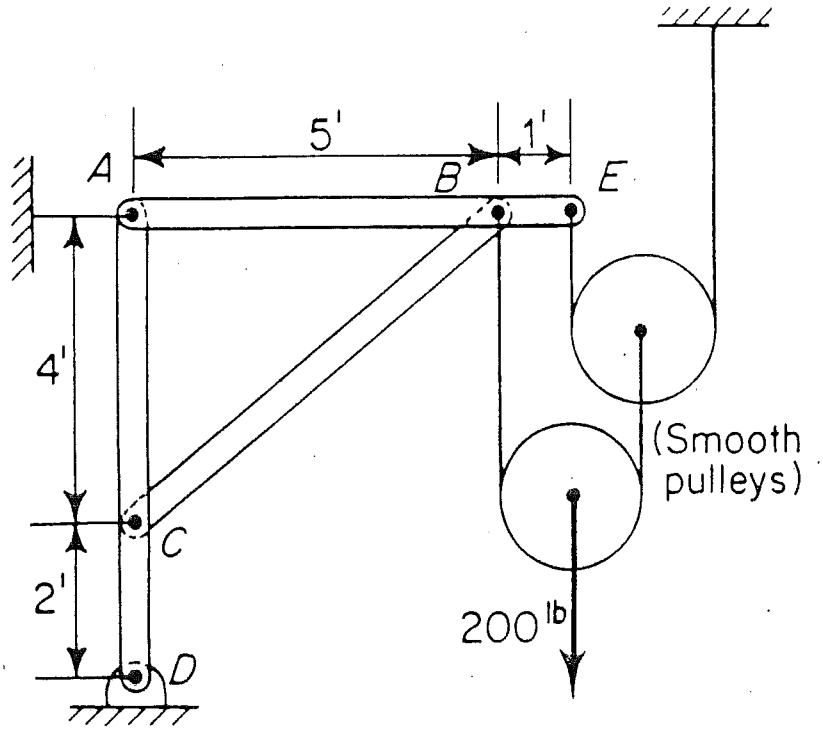
1. The building slab is subjected to four parallel column loadings. Determine the equivalent resultant foree and specify its location (x, y) on the slab, if $F_1 = 20$ kN and $F_2 = 50$ kN.



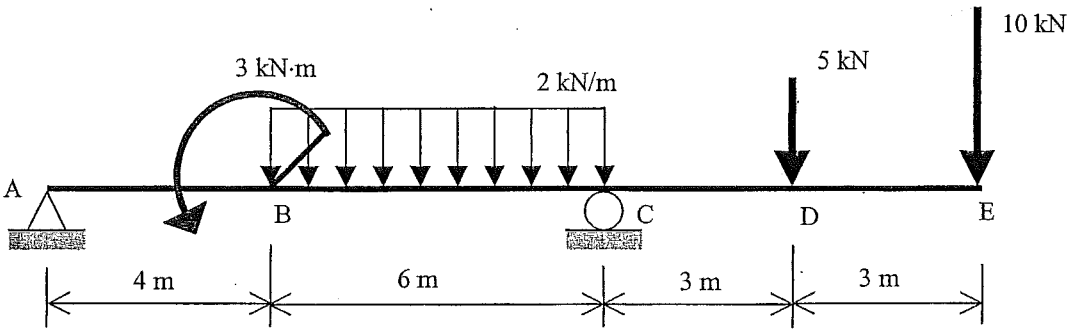
2. Determine the axial forces in members CD, EF, FJ and IF of the pin-connected truss shown. Indicate whether these members are in tension or compression.



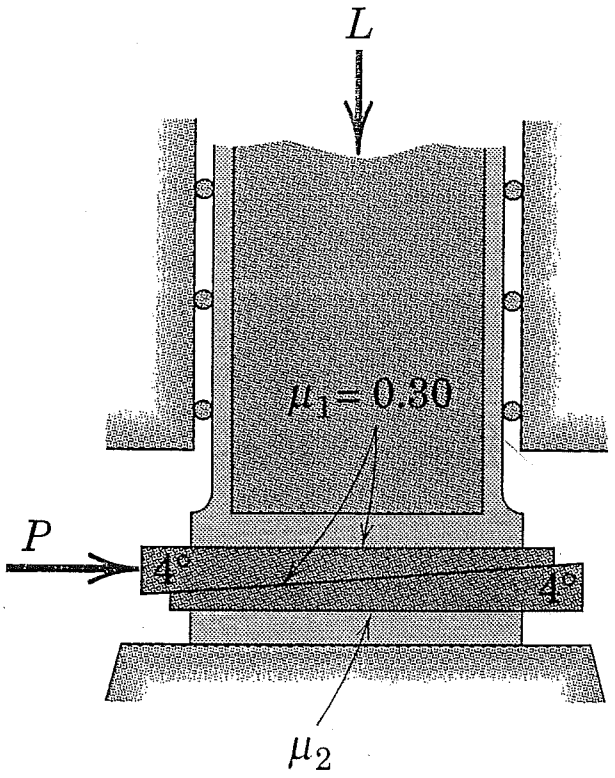
(3) Cables are attached to pins at A, B, and E, as shown. Determine the horizontal and vertical components of the pin reaction at C on member DCA. Neglect all weights (members and pulleys).



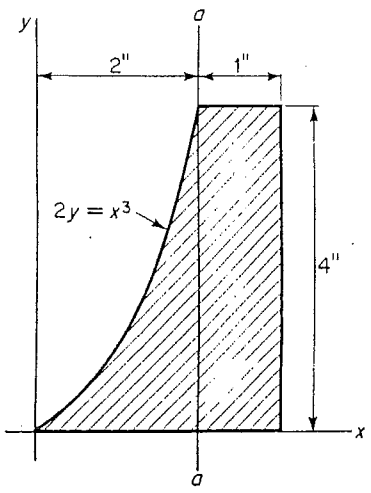
(4) Draw the shear force and bending moment diagram for the beam and loading shown. The loading consists of an applied moment (3 kNm) at B, a uniformly distributed load (2 kN/m) between B and C, a point load (5 kN) at D and another one (10 kN) at E.



5. The two 4° wedges are used to position the vertical column under a load L. What is the minimum value of the coefficient of friction μ_2 for the bottom pair of surfaces for which the column may be raised by applying a single horizontal force P to the upper wedge.



6. Determine the moment of inertia of the shaded area with respect to *aa* axis.



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ENGR 242/2 STATICS, Section X, Fall 2002

Test #2

Attempt all questions. Only non-programmable calculators are permitted. Time: 60 minutes.

Marks: 10 points per problem (Total is 30).

1. Determine the tension in cables BC and BD and the reactions at the ball-and-socket joint A for the mast shown in Figure 1 below.

2. The 3-m-wide rectangular gate is pinned at its center C. Determine the torque M that must be applied to its central shaft in order to open the gate. Specific weight of water: $\gamma_w = 9810\ \text{N/m}^3$.

3. For the plane area shown in Figure 3 below, determine
   (a) the first moments of area with respect to the X and Y axes,
   (b) the location of the centroid, and
   (c) the volume of the body of revolution obtained by rotating the area about the X axis.

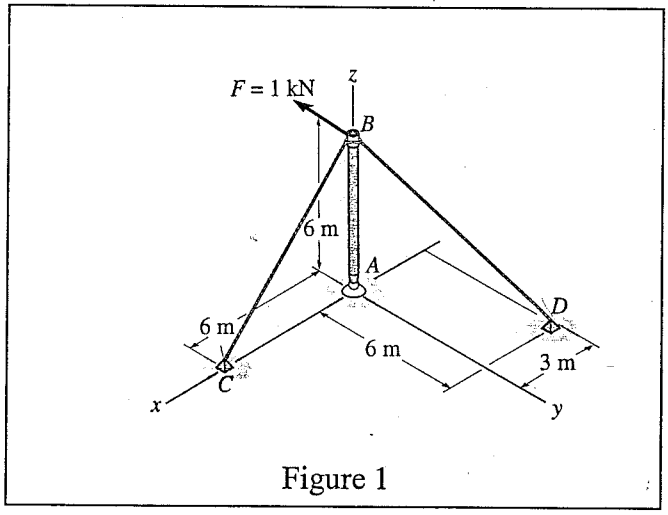

Figure 1

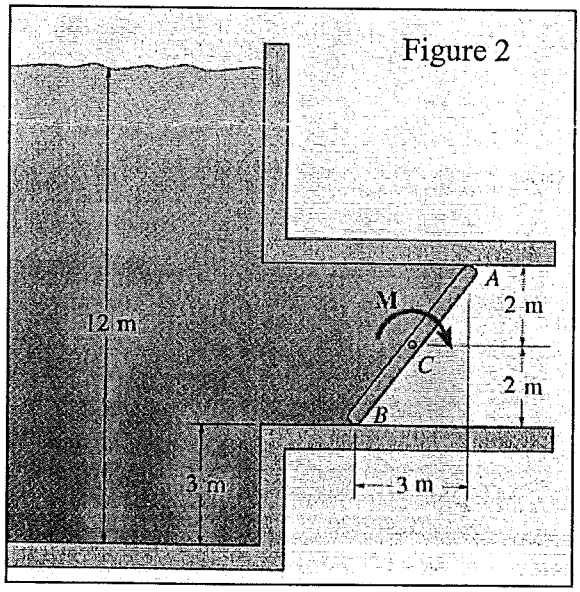

Figure 2

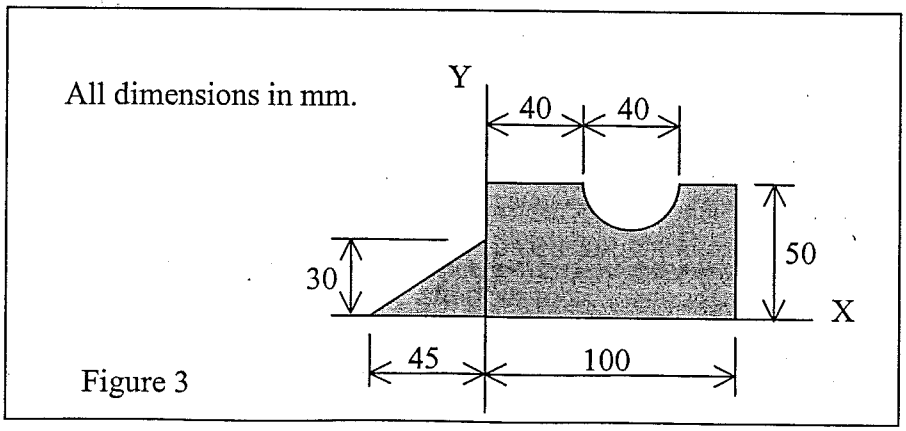

Figure 3

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ENGR 242/2 Statics Section V

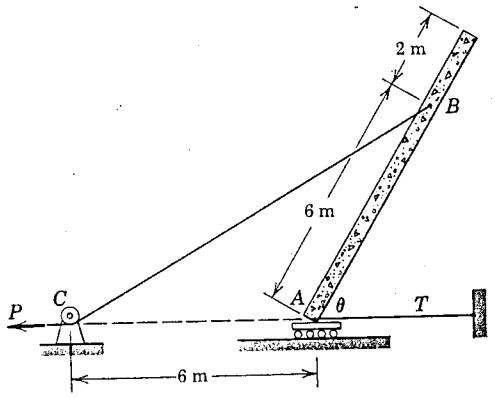
Fall 2001

Test #2

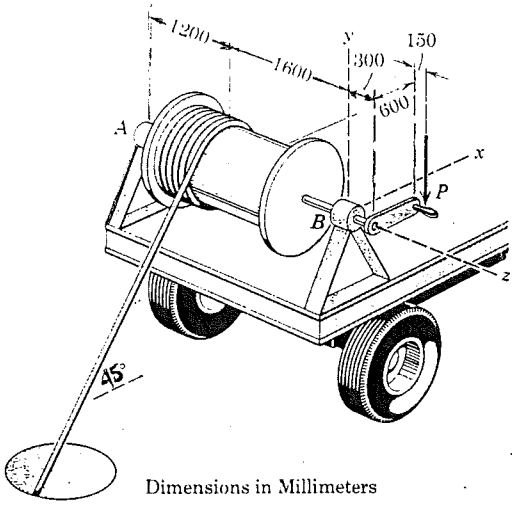
Please attempt all questions, only calculators permitted. Time: 60 minutes

Marks

35 1) The uniform concrete slab shown in edge view has a mass of 25 Mg and is being hoisted slowly into a vertical position by the tension P in the hoisting cable. For the position where $\theta = 60°$ calculate the tension T in the horizontal anchor cable by using only one equation of equilibrium.

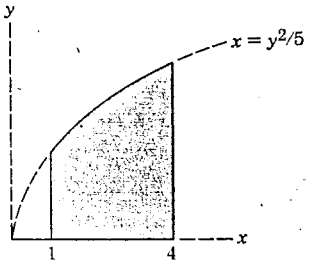


35 2) A force P of 200 N on the handle of the cable reel is required to wind up the underground cable as it comes from the manhole. The drum diameter is 1000 mm. For the horizontal position of the crank handle shown, calculate the tension of the cable.



Dimensions in Millimeters

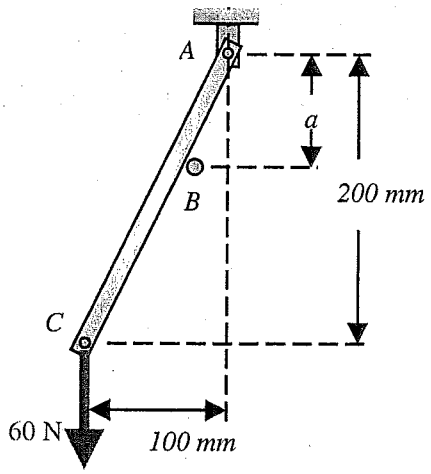
30 3) Determine the x coordinate of the centroid of the shaded area.



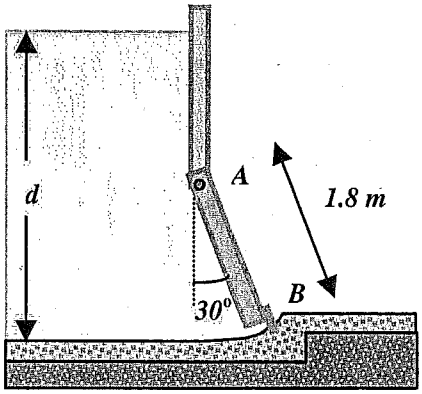
Concordia University, Faculty of Engineering and Computer Science
ENGR 242/2 Statics, Section X TEST #2

SOLVE ONLY THREE OF THE FOLLOWING PROBLEMS

(1) Rod AC is supported by a pin and bracket at A and rests against a peg at B. Neglecting the effect of friction, determine (a) the reactions at A and B when a = 80 mm, (b) the distance *a* for which the reaction at A is horizontal and the corresponding magnitudes of the reactions at A and B.

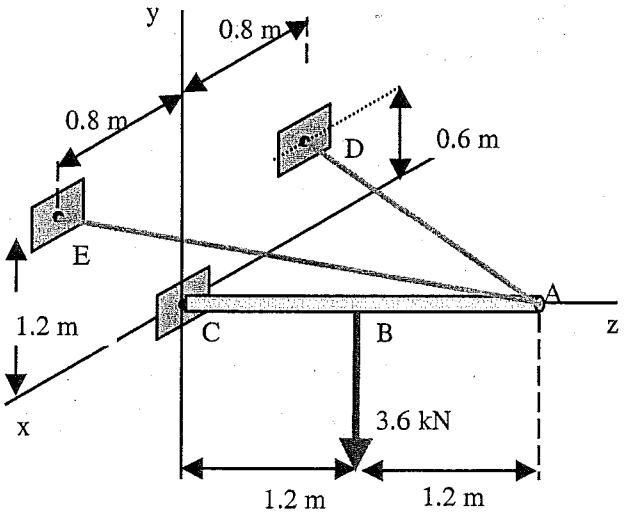


(2) The square gate AB is held in the position shown by hinges along its top edge A and by a shear pin at B. For a depth of water d = 3.5 m, determine the force exerted on the gate by the shear pin.



2,4

(3) A 3-m pole is supported by a ball-and-socket joint at C and by the cables AD and AE. Determine the tension in cables and the reaction at C.



(4) Determine the centroid of the shaded area. Express your answer in terms of a and b.