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University of Ottawa
Faculty of Engineering

Department of
Civil Engineering

GNG 1105
ENGINEERING MECHANICS

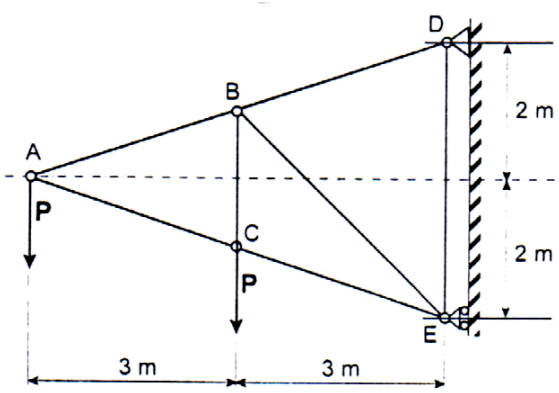
Final Examination
December 9th, 2011
Profs. A. Skaff, Ph. Girault, Y. Haddad and A. Ahmed

Duration: 3 hours

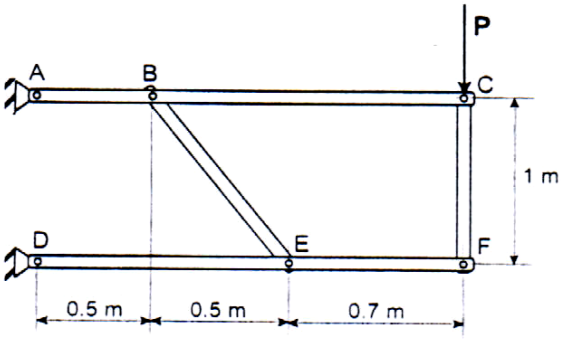
Closed book examination. Programmable calculators are not allowed.
Free-body diagrams must be drawn where applicable.

Problem 1. (10/60) The truss shown is loaded by two forces P = 8 kN. All joints are pinned.

a) Determine the reactions at the supports D and E.
b) Using the method of sections, determine the forces in members BD, BE and CE in the truss, specifying for each whether it is in tension or compression.



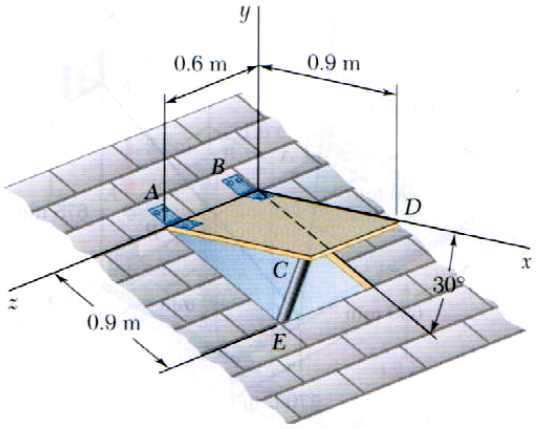
Problem 2. (12/60) The diagram shows a frame which is loaded by a force P = 20 kN. All joints are frictionless pins. Determine the reactions at A and D and all forces acting on member DEF. Note that members ABC and DEF are continuous solid members.



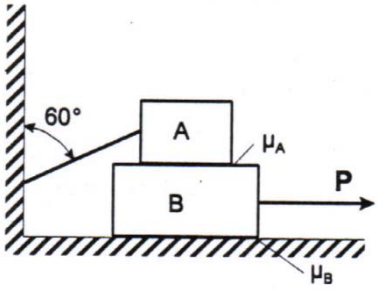
Problem 3. (14/60) A 30 kg cover for a roof-opening is hinged at corners A and B. The roof forms an angle of 30° with the horizontal, and the cover is maintained in a horizontal position by the brace CE. Determine:

(a) The magnitude of the force exerted by the brace CE,

(b) The reactions at the hinges A & B. Assume that the hinge at A does not exert any axial thrust.



Problem 4. (14/60) Block A in the sketch has a mass of 20 kg and is attached to the wall by means of a cord at an angle of 60° with the vertical, while block B has a mass of 40 kg. The coefficient of static friction between A and B is 0.2, while the coefficient of static friction between B and the floor is 0.3. Determine the minimum force P required to cause Block B to slide (i.e. Motion impending).



Problem 5. (10/60) A ball is thrown from the top of a 20m high tower with an initial velocity of V_0 = 10 m/s in the direction shown.

(a) Determine the x and y coordinates of the point at which the ball strikes the slope.

(b) Determine the velocity of the ball at the point at which it strikes the slope.