Minor 1

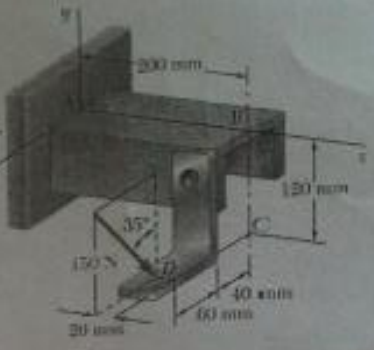
AML110 Mechanics 30-8-2013

Maximum Marks : 60

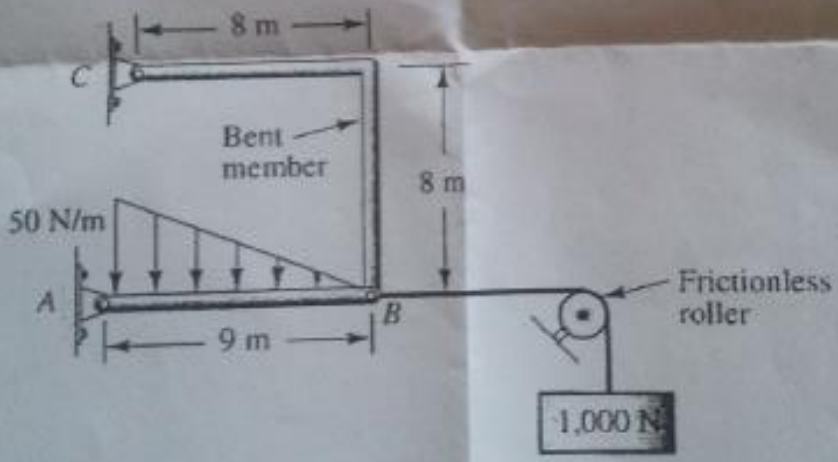
Please answer all the 6 questions. Please read the full question paper before you start answering. You can answer the questions in any order but all the working for the same question should be done together. All questions are worth 10 marks each.

Q1. Given a machine component where a 150N force is acting as shown.

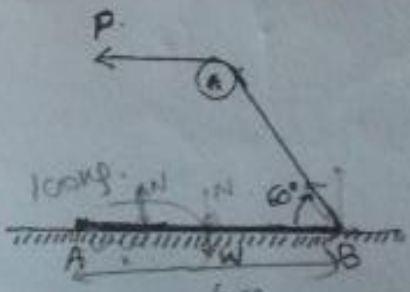
a) Find the Moment of the 150N force about the axis AC.
b) Replace the 150N force by an equivalent system at A.



Q2. A straight member AB is connected by a pin joint to an L shaped bent member BC. A string is also connected to the pin at B at one end, passes over a frictionless roller and then connected to a 1000N weight at the other end. Find the supporting force system at A. Neglect the weight of the members AB and BC.



Q3. A uniform log AB of length 4m and mass 100 kg is moved by a rope tied to its end B and passing over a frictionless pulley. A force P is applied to one end of the rope as shown. Compute the largest force P for which the log remains at rest. The coefficient of static friction between the log and the ground is 0.8.



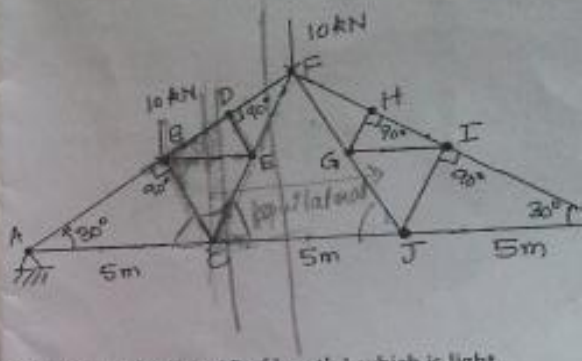
Q4. Consider the uniform horizontal beam AB of length 6m and weight W = 600N. It is supported by a roller at A and a pin at B. A force of 600N acts downwards at the midpoint C of the beam. Write the expression for the Shear Force and Bending Moment for the beam for $0 < x < L$. Also draw the Shear Force and Bending Moment Diagram indicating the critical values. DO NOT NEGLECT THE WEIGHT OF THE BEAM.

Q5. A truss is loaded as shown.

a) Identify the zero force members by inspection. (Negative marking for incorrect responses).

b) Find the Reaction at the supports A and K.

c) Find the forces in members BD and EF.



Q6. A downward force P is applied to the midpoint of a uniform bar AB of length L which is light and is lying on the ground. The normal reaction from the ground acting at the contact surface varies linearly along the length of the bar with the maximum value w_0 at the midpoint and going to 0 at the two ends (see figure). Assume the width of the bar is negligible as compared to its length.

a) Determine the value of w_0 in terms of the given quantities.

b) A moment M is applied to the centre of the bar as shown. Determine the value of M at which the bar will start rotating. The coefficient of static friction between the bar and the ground is μ.