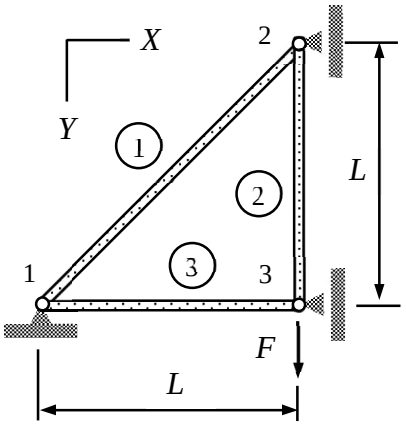
Name_____ Student number_____

Problem 1

The structure shown consists of three elastic bars connected by joints and a point force acting on node 3. Young's modulus of the material is E. The cross-sectional area of bars 2 and 3 is A and that for bar 1 is $\sqrt{2}A$. Determine the displacement components u_{Y2} and u_{Y3}.



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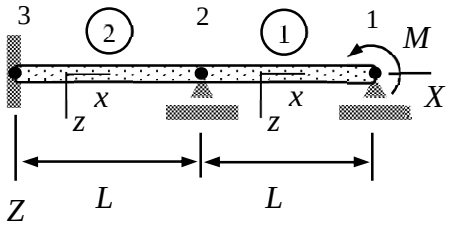
Problem 2

Beam structure of the figure is loaded by a point moment acting on node 1. Determine the rotations θ_{Y1} and θ_{Y2} by using two beam bending elements. Displacements are confined to the XZ – plane. The cross-section properties of the beam A, I and Young's modulus of the material E are constants.



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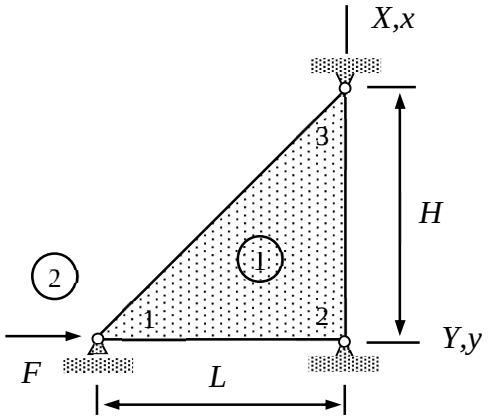
Problem 3

A thin triangular slab of thickness t is loaded by a point force at node 1. Nodes 2 and 3 are fixed. Derive the virtual work expression δW of the structure in terms of u_{Y1}, and solve for the nodal displacement. Approximation is linear and material parameters E and ν are constants. Assume plane-stress conditions.



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Problem 4

A plate, which is clamped on one edge, is loaded by distributed force q (force per unit length) as shown. Use the bending mode virtual work density of the plate model to find the transverse displacement. Use approximation $w = a_0 x^2$ in which a_0 is the parameter to be determined. Material properties E, ν and thickness t are constants.