Lightweight structures and FEM - Lab 1

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Since the purpose of lab 1 is to write a MatLab code and make sure that it works this is basically a self-assessment exercise. You are expected to tick the boxes below once you have verified that the addressed load cases are handled correctly.

Hint: The easiest way to examine the different load cases is to temporarily let $EI=GJ=1$ and apply unit loads, one at the time. The sought displacements are then easily compared with results for standard load cases of a cantilever beam, found in engineering handbooks.

The MatLab code is accurately calculating deformations and support reactions for

☑: a point load at the end of the beam

☑: a distributed load over the entire beam length

☑: a point torque at the end of the beam

☒: a distributed torque over the entire beam length

For these load cases the deformations at the free end and the reactions at the support should be independent of the number of elements in the beam. This should also be verified.

☑: The resulting end deformations and support reactions for the cases above are independent of the number of elements in the model.

☑: The code accurately calculates Euler and torsion buckling loads for beams.

Comments or questions (optional):

For the case of a wing beam, the second moment of area will vary along its length, meaning that the stiffness matrix (K) and the mass matrix (M), which is not used in this exercise, will include an inertia term which is function of z. Since the integral is always performed on one element (from z=0 to z=h), this will be problematic because the second moment of area keeps on changing along the z direction...

Date and examiners signature:.....