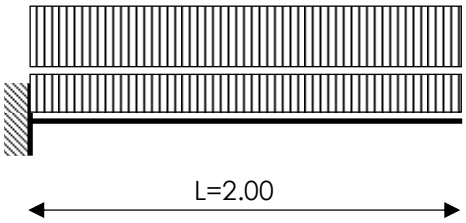
Design of Steel I
MSc Design of Steel Structures
master universitario di secondo livello

Module B

Stability of Steel Structures

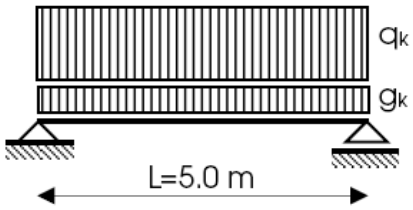
Week 4 – Topic: Lateral-torsional buckling

Homework 1: Check the cantilever beam in the following figure against lateral-torsional-buckling assuming a section IPE 200 made out of steel S 275.



Compare the result derived by the EC3 provision with the practical "isolated flange" method.
Finally, determine the maximum length of the cantilever for the lateral-torsional buckling failure not to occur.

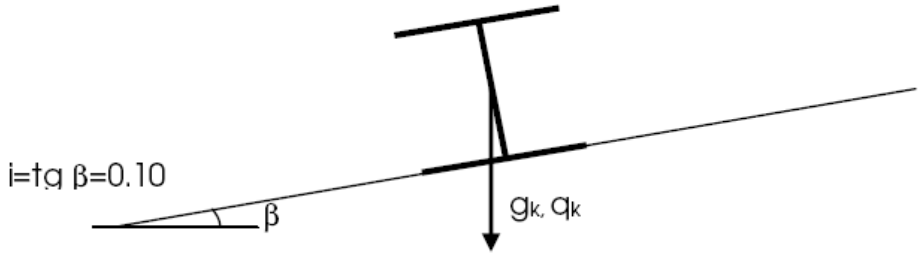
Homework 2: The beam-column represented in the figure below is loaded by a transverse load whose permanent and variable parts are g_k=3.0 kN/m and q_k=5.0 kN/m, respectively.



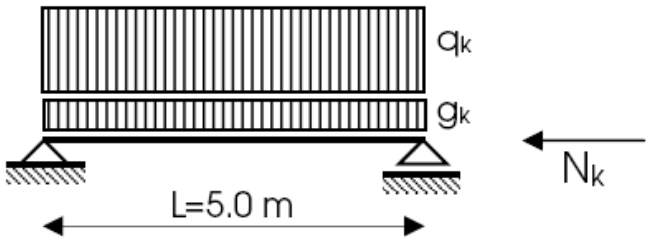
Assuming that the column is made out of S275 steel profile IPE 200, answer the following questions:

- classify the section looking after the actual state of stress of the member;
- perform the strength check at the Ultimate Limit State (ULS);
- perform the stability check of the member against lateral-torsional buckling;
- determine the maximum value of the live load q_k resulting in lateral-torsional buckling.

Homework 3: Assume that the above member would represent the secondary beam (namely, the purlin) within the inclined roof of a single storey industrial beam. If a 10% slope is considered for that roof, classify the transverse section and carry out the relevant check against lateral torsional buckling.



Homework 4: The beam-column represented in the figure below is loaded by an axial force N_k=50 kN and a transverse load whose permanent and variable parts are g_k=3.0 kN/m and q_k=5.0 kN/m, respectively.



Assuming that the beam-column is made out of S275 steel profile IPE 200, answer the following questions:

- classify the section looking after the actual state of stress of the member;
- perform the relevant check of the member against lateral-torsional buckling failure.