133CM03 – Homework assignment Winter 2016/2017 **Name:……**

Post-tensioned prestressed concrete bridge - assignment

Design a post-tensioned prestressed concrete bridge of a three-span arrangement. The construction is prestressed at the age of 7 days and put into operation at the age of 100 days. The durability is expected to be 100 years. The structure is loaded by the dead load $\boldsymbol{g_0 + g_{add}}$ and live load $\boldsymbol{q}$.

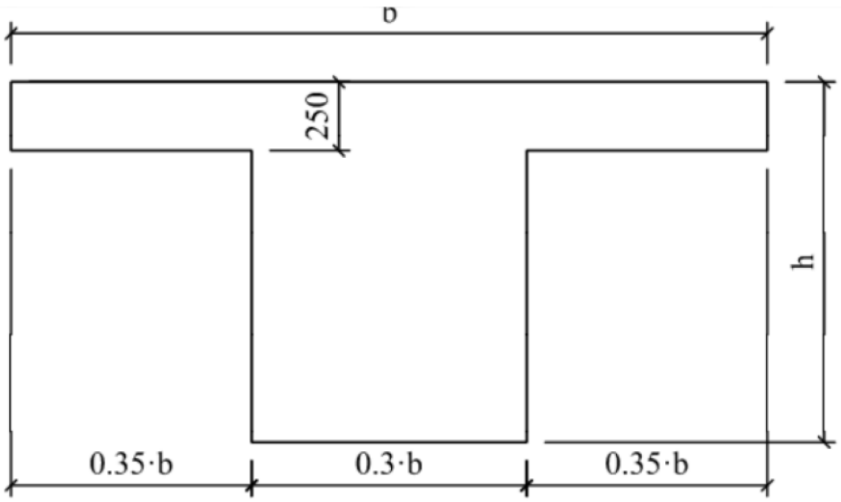
Individually assigned input parameters are:

$\boldsymbol{L}$ [m]	length of the middle span
$\boldsymbol{b}$ [m]	cross-sectional width
$\boldsymbol{a}$ [-]	ratio of outer span to middle span
$\boldsymbol{h}$ [m]	cross-sectional height
$\boldsymbol{g_{add,k}}$ [kN/m^2]	additional dead load except own weight – characteristic value
$\boldsymbol{q_k}$ [kN/m^2]	live load – characteristic value

Prestressing reinforcement: 7-wire tendons, diameter 15 mm;

f_{pk} = 1770 MPa; $f_{p0.1k}$ = 1560 MPa

Cross-section



Tasks:

- cross-section geometry characteristics (area A; position of centre of gravity - cg; moment of inertia I)
- internal forces (N, V, M), extreme values of internal forces caused by live load
- number of tendons
- losses of prestress
- rigorous SLS assessment in decisive cross-sections (stress limit)
- ULS assessment in one of the decisive cross-section
- structural drawing, prestressing reinforcement drawing