Aalto University
School of Engineering (ENG)
Department of Civil Engineering Final Exam 10.12.2020

CIV-E4020 - Design of Bridges L (5 cr)

Please write in every paper: -the name and the number of the course
-the date of the examination
-your name and the student ID
-the name of the department

Note: (1) Closed-book exam (No reference material allowed).
(2) Calculator, ruler, pencil, and eraser are allowed.
(3) Examination time: 13:00-16:20. 3 hours for the exam, and 20mins reserved for submission.
(4) Questions during exam: you may ask through Zoom chat.
(5) If you cannot submit in MyCourses portal, please submit by email to youqi.zhang@aalto.fi and weiwei.lin@aalto.fi, before the deadline.
(6) Five questions in total, 20 marks /100 (or 5 points /25) for each question.

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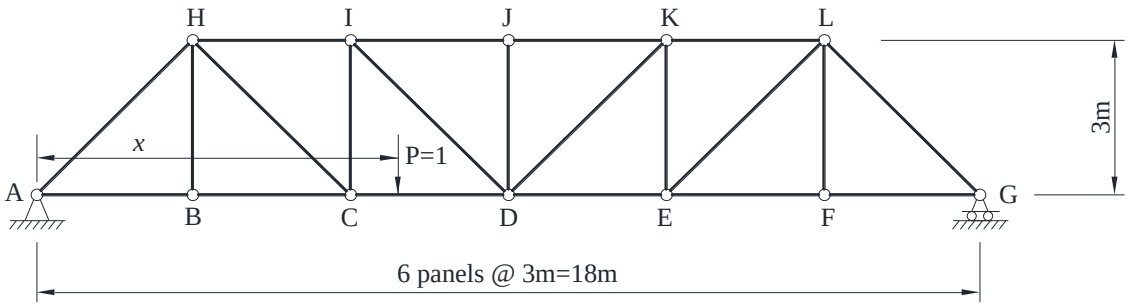
1. Please classify the bridge's superstructures according to the materials of constructions, span length, span types and structural forms, respectively. For bridges classified according to structural forms, please give a brief description to their structural characteristics. (2) The selection principles for bridge types.

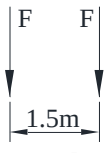
2. Describe the four "load models" for vertical loads (road traffic actions on bridges) in the Eurocodes.

3. Describe the classification of suspension bridges according to (a) number of spans; (b) continuity of stiffening girders; (c) types of suspenders; and (d) types of cable anchoring.

4. Consider the Pratt truss as shown in **Fig.1** (a), (1) construct the influence lines for the vertical reactions at supports *A* and *G*; (2) construct the influence lines for the axial forces in members *IJ*, *ID*, *CD*, *and LF*; (3) for the load set shown in **Fig.1** (b), determine the maximum axial forces (either in tension or compression) of member *IJ*, *ID*, *CD*, and *LF*, respectively.



(a) Pratt truss



(b) Load set

Fig.1 Influence line of a truss

5. A bridge will be built over a river shown in **Fig.2**. Please propose ***three*** preliminary designs with different structural forms. Requirements: (1) clearly indicate the number of spans and length of each span, (2) describe briefly your design ideas or considerations.

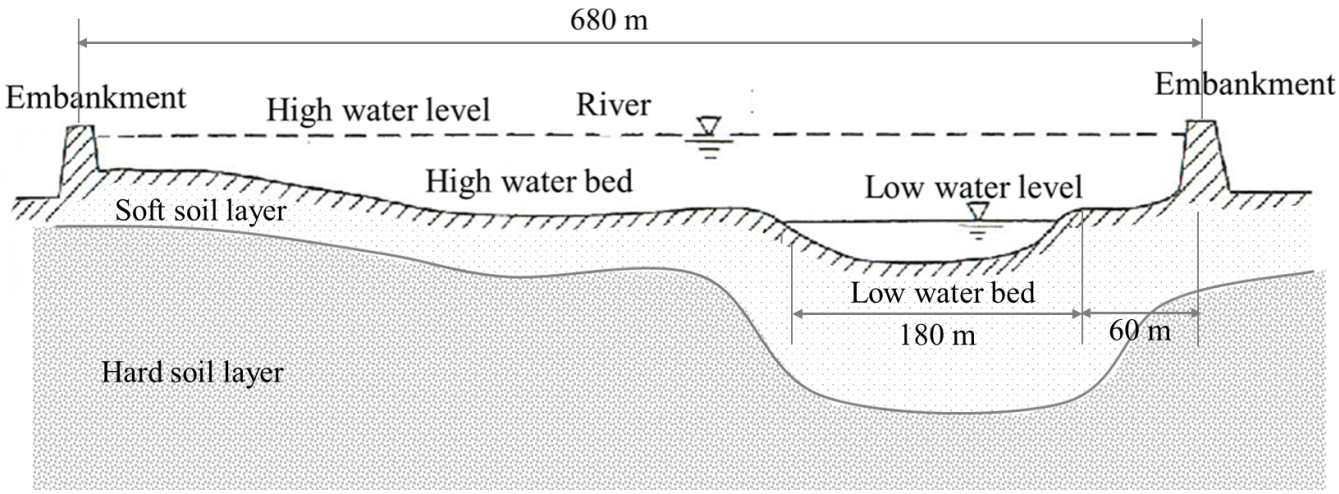


Fig.2