AALTO UNIVERSITY
School of Engineering (ENG)
Department of Civil and Structural Engineering EXAMINATION 19.10.2015

Rak-43.3301 Repair Methods of Structures I (4 cr)

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

Note: No literature allowed in the examination!
Use the same numbering style in your answer!

1. **Deterioration processes**

Your task is to investigate the condition of a **reinforced concrete harbour structure** in Finland. The structure is partially immersed in the seawater.

1.1. Define the causes of damage and deterioration for this type of structures (1p)
1.2. Describe at least three (3) deterioration mechanisms that are expected to affect this type of reinforced concrete structures. (3p)
1.3. What kind of damage could be found related to environmental factors and concrete properties for this type of structures? (2p)

2. **Destructive and non-destructive tests**

2.1. What are the **typical situations** where Non-Destructive Testing (NDT) methods are needed? (2p)
2.2. Describe the Ultrasonic pulse velocity in concrete (UPV) [ASTM C597] for assessing the concrete quality. Describe the measurement principle, detected damage, kind of structural members could be assessed and interpretation of the test results? (2p)
2.3. Define the different diagnosis techniques for building façade wall renderings? (2p)

3. **Building condition evaluation and repair recommendation**

3.1. Describe the different damage classes for (i) cracking of concrete and (ii) Corrosion of reinforcement. (2p)
3.2. Define the "Condition Index" ratings, status, description and action required to represent the general condition of structure assets. Consider ratings from 0 to 100% and ratings from 1 to 5. (2p)
3.3. Recommend repair principles for (i) protecting concrete structures against ingress of liquids and gasses, (ii) preserving or restoring passivity of reinforcement steel and (iii) maintaining of brick masonry walls. (2p)

4. **Miscellaneous topics**

4.1. Describe the mechanism of Alkali Silica Reaction (ASR) of concrete structures and the appearance of ASR damage. (2p)
4.2. Your task is to carry out a field inspection of a mould damaged residential building. What are the suspected locations of the mould hazard in the building and what kind of field and laboratory tests are available for investigating the mould growth? (3p)
4.3. What was good / needed to be improved on the course? Which factors in particular supported / complicated your learning? (1p)

Kysymykset suomeksi →