

Exam 17.12.2013

Exam duration: 3 hours

General remarks:

- Exam should be written in English
- It is allowed to use a dictionary
- You must return the examination questions with your work!

Requirements:

- You must have passed the Concrete Technology I course
- You must have finished your design exercise or at least received confirmation from Jukka Makinen allowing to attend the exam
- You must have signed up to the exam in advance

Production Technology of Concrete Structures Rak-82.2121

1. Structure below will be made using sliforming method:
 - a. Make schematic drawings of the needed system and name the main parts of the system (clearly mark lifting mechanism and working platforms) **1.5p**
 - b. Describe the concrete casting process (including montage of formwork, reinforcement, casting, curing) **2.5p**
 - c. Describe requirements for concrete mix design. **1p** (430)
 - d. Describe benefits and drawbacks of this method and indicate at least one alternative method. **1p**



Only this part!

6

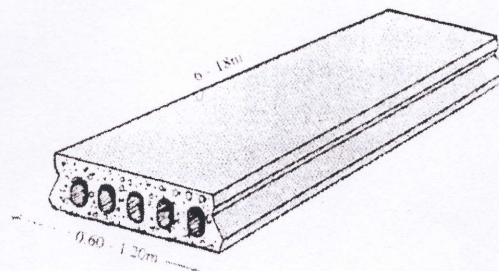
2. Describe the optimal curing procedure:
 - a. Draw figure showing heat development of a typical concrete (time vs heat) **1p**
 - b. Mark types of shrinkage occurring at each characteristic part of that curve **1.5p**
 - c. Describe recommended actions preventing shrinkage for each characteristic part of that curve **1.5p**
 - d. List types of available curing methods **1p**

3. Hot weather concrete works and massive structures
 - a. Define conditions when "hot weather" principles for concrete works should be applied **2p**.
 - b. Definition of plastic shrinkage and describe what are the prevention methods (ways) against crack formation caused by plastic shrinkage? **2p**.
 - c. What is the maximum concrete temperature and maximum gradients within the element (during hydration processes). How the type of aggregate affects the allowed maximum temperature gradient within the concrete element **2p**
 - d. Describe and draw the affect of the subgrade (a surface on which the concrete element is made) on thermal cracking of massive structure, draw typical crack pattern, **1p**
 - e. Describe basic recommendations for mix design of concrete to be used in massive structures or at ambient temperatures of 30 degrees. **2p**
 - f. Describe methods for lowering fresh concrete temperature, **2p**

4. Precast concrete

The task is to produce 50 pre-stressed hollow core slabs as shown below (all slabs have width of 1.2 m and length of 6 m !) using sliforming method (not extruders!!!).

 - a) Describe principle of sliforming and draw cross section of a typical sliforming machine used in precast concrete, **2p**
 - b) Describe difference between extruder and slipforming casting machine for production of hollow core slabs, **1p**
 - c) Draw production line (indicate and name all needed machines) **1p**
 - d) Describe required properties (workability and early strength- 24 hours) of concrete mix used for extrusion **1p**



5. Define the following types of joints which can be made in floors and slabs:
- Isolation joints
 - Contraction joints
 - Construction joints

Make schematic drawing for each type of joint and point out where/when each of these joints shall be made.

6p

Production Technology of Concrete Structures

Rak-81.2/31

- Make schematic drawing of the render system and name the main parts of the system (sandy, work lifting mechanism and working platform) 1.5p
- Describe the concrete casting process (including mixture of concrete, reinforcement, casting, curing) 2.5p
- Describe requirements for concrete mix design 1p 11.70
- Describe benefits and drawbacks of this method and propose a good alternative method 1p

