

<b>Sukunimi (myös aik.) / Family name (incl. previous)</b> enter last name	<b>Etunimet / First name(s)</b> enter 1st name.	<b>Opiskelija nro / Student nbr</b> 000000			
<b>Tutkinto-ohjelma / Degree Programme</b> enter degree programme.	<b>Kurssikoodi ja -nimi / Course code and name</b> CIV-E2060 - Production Technology of Concrete Structures L				
	<b>Syntymäaika / Date of Birth</b> 01.01.1990	<b>Tentin pvm / Date of exam</b> 21.04.2021			
<b>Opettaja(t) / Teacher (s)</b> enter 1st teacher's name. enter 2nd teacher's name.	<b>Tarkastaja täyttää / Filled by the examiner</b>				
	1	2	3	4	5
					6

- Open book exam / Online exam (**Please use only this word document template**)
- Write on the answer document: your surname, first name and student number.
- **DO NOT copy and paste directedly from any source, just write your own text as answers.**  
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**Question 1.**
**(15p)**

- 1.1 Explain the role of compaction in the production of concrete structures. Which are consequences if the compaction is a) inadequate and b) too effective? Which factors are affecting the required compaction time?
- 1.2 Your task is to investigate the quality of hardened concrete structure. What are the factors affecting the estimated strength of hardened concrete in structure?
- 1.3 You are responsible for casting of massive foundation structure ( $10 * 10 * 3 \text{ m}^3$ ) in July in Finland. Present your choices to keep the concrete temperature during hydration below  $+60 \text{ }^\circ\text{C}$ .

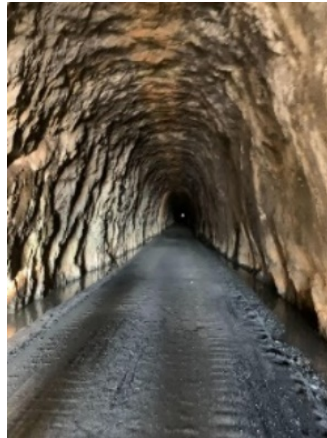
**Answer question 1 here and use the same numbering**

**Question 2.****(15p)**

- 2.1 What are the major advantages and also disadvantages of pre-cast concrete elements compared to cast-in-situ structures?
- 2.2 When building an apartment building in Finland, for which structures you would select pre-cast elements and which structures you would produce cast-in-situ? Justify shortly your choices.
- 2.3 Explain (*shortly*) the manufacturing process of hollow core slab elements. Also explain a solution for bathroom areas when hollow core slabs are used.

**Answer question 2 here and use the same numbering****Question 3.****(15p)**

- 3.1 Your task is to select a suitable concreting method for wall lining of underground tunnel (presented below). What is the most suitable concreting method you select? Describe (shortly) the procedure of the selected method.



- 3.2 What are the most common methods of under water concreting?
- 3.3 What are the typical work phases of slip form construction?

**Answer question 3 here and use the same numbering**

**Question 4.****(15p)**

Select the right statement and justify your answer

(Notice: points are given for the right selection and justifying the answer)

4.1 Statistical quality control of concrete helps

- a) in narrowing down the tolerance limits of variability
- b) in taking into account the actual variability of concrete
- c) to ascertain the range of value that can be expected under existing conditions
- d) All of the above

4.2 The mixing time of concrete:

- a) is the time required to produce uniform concrete
- b) is counted from the instant when all the solid materials have been put in the mixer
- c) is independent of the number of revolutions
- d) may be ignored in favor of number of revolutions
- e) All of the above.

4.3 Identify incorrect statement(s):

- a) The formwork may be defined as moulds of timber or some other material into which the freshly mixed concrete is poured at the site and which hold the concrete till it sets.
- b) The formwork includes the total system of support of freshly placed concrete, i.e., form lining and sheathing plus all necessary supporting members, bracings, hardware and fasteners.
- c) The main objective of formwork is the smooth and esthetically attractive external surface of concrete.
- d) In addition to forms being of right size, a good formwork should be strong, stiff, smooth and leak proof.

4.4 While using vibrators for compacting concrete mixes:

- a) vibrators are used for spreading concrete in the form
- b) vibrators reduce entrapped air from concrete
- c) vibrators cause smaller and lighter constituents to rise to the surface and give better finish
- d) prolonged vibration reduces chances of segregation
- e) all of the above

4.5 In cold weather concreting it is recommended to:

- a) heat the water for mixing
- b) use insulating formwork and delay its removal
- c) use additional quantity of cement
- d) use air-entraining agents
- e) All of the above

Answer question 4 here and use the same numbering