



<b><u>PROGRAM</u></b>	: BACCALAUREUS INGENERIAE CIVIL ENGINEERING
<b><u>SUBJECT</u></b>	: CONCRETE TECHNOLOGY 1B & 2B
<b><u>CODE</u></b>	: BTK1B21 & BTK2B21
<b><u>DATE</u></b>	: SUMMER EXAMINATION NOVEMBER 2016
<b><u>DURATION</u></b>	: (SESSION 1) 08:30 - 11:30
<b><u>WEIGHT</u></b>	: 50 : 50
<b><u>TOTAL MARKS</u></b>	: 100
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<b><u>ASSESSOR</u></b>	: MR J J BESTER
<b><u>MODERATOR</u></b>	: MRS S BADENHORST
<b><u>NUMBER OF PAGES</u></b>	: 3 PAGES
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<b><u>INSTRUCTIONS</u></b>	: CALCULATORS MAY BE USED. : SHOW <b><u>ALL</u></b> CALCULATIONS. : STATE ALL ASSUMPTIONS.
<b><u>REQUIREMENTS</u></b>	: QUESTION PAPERS MUST BE HANDED IN WITH THE ANSWER SHEET.

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## INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

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### QUESTION 1 [10]

Discuss the role of each of the main four (4) constituents that is used in concrete.

### QUESTION 2 [12]

- 2.1 For cement to hydrate, a w:c ratio of around 0,20 is needed. When designing a concrete mix, the minimum w:c ratio is around 0,38. Explain the difference in the two values. (4)
- 2.2 Sketch the strength development curve for a concrete made using CEM I cement, having been cured as per requirements, and having a specified characteristic strength of 25 MPa. **On the same graph** sketch the strength development curve for a concrete made using a blended cement consisting of 50% CEM I and a 50% fly ash. (8)

### QUESTION 3 [10]

Figure 1 indicates a foundation. Determine the nominal proportions, when the mix proportions are 3 : 2.75 : 1 (stone : sand : cement). All calculations must be performed to two (2) decimals.

### QUESTION 4 [5]

With the knowledge that you have gained in this course, comment on the correctness of the following test results:

- 4.1 Fineness modulus of sand: 2.75
- 4.2 Relative density of water: 2 400kg/m<sup>3</sup>
- 4.3 Relative density of water: 1 000kg/m<sup>3</sup>
- 4.4 Compacted bulk density of stone: 1 340kg/m<sup>3</sup>
- 4.5 Compressive strength of concrete: 25,0 MPa

**QUESTION 5** [11]

- 5.1 You are working for TYU Construction, and are starting on a construction site as the concreting foreman. On the Monday that you start on the construction site there is dew on the materials. You perform a water content test on the sand and stone, and find the moisture contents to be 5.2% and 1.3% respectively. Adjust the following mix design to take the moisture contents into consideration. (7)

Water = 190 liter  
Binder = 400 kg  
Sand = 890 kg  
Stone = 1 040 kg

- 5.2 The following values are used to load the 0,5m<sup>3</sup> concrete mixer that you are currently using on a construction site. The 0,5m<sup>3</sup> concrete mixer breaks, and you hire in a concrete mixer with the capacity of 0,75m<sup>3</sup>. Change the values (used for the 0,5m<sup>3</sup> mixer) to fit the 0,75m<sup>3</sup> mixer. (4)

Water = 100 liter  
Binder = 190 kg  
Sand = 460kg  
Stone = 510 kg

**QUESTION 6** [10]

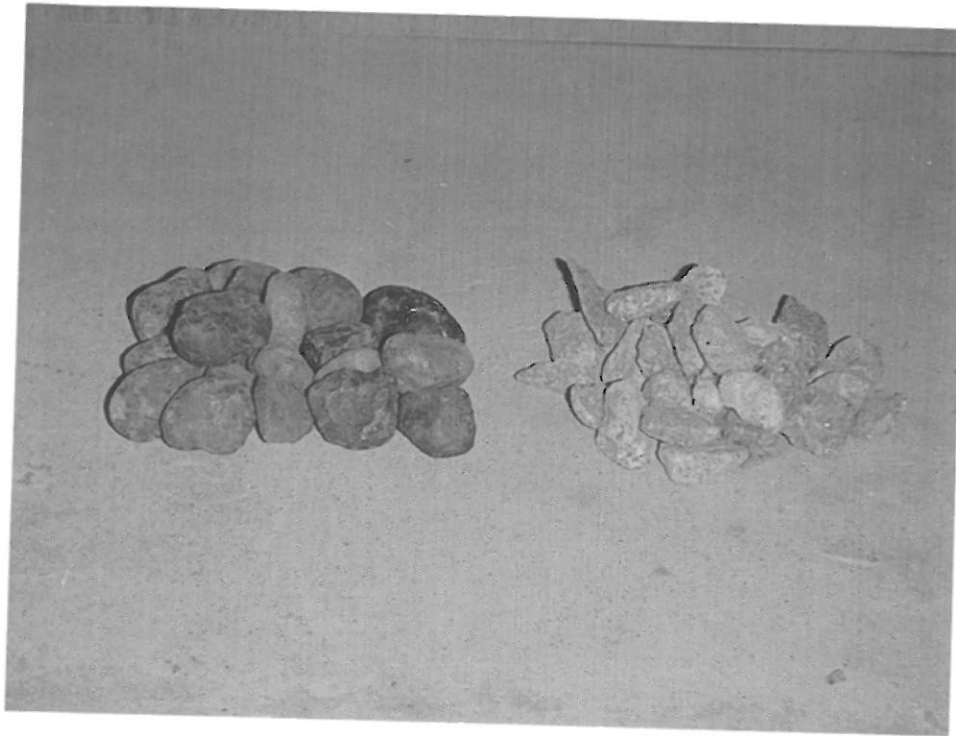
- 6.1 Name two ways in which the gamma ferric oxide layer around reinforcement may be broken down. (2)
- 6.2 Name three (3) types of steel reinforcement that may be used in concrete. (3)
- 6.3 Name five (5) factors that affect the bond between concrete and reinforcement. (5)

**QUESTION 7** [10]

- 7.1 List five (5) advantages of using ready mix concrete. (5)
- 7.2 List five (5) factors that should be considered when selecting the method of placing fresh concrete. (5)

**QUESTION 8** [10]

- 8.1 Figure 1 indicates two different stones that may be used in the manufacturing concrete. Discuss the influence on the properties of fresh, as well as hardened concrete will be. (4)



Picture 1: Two stone types.

- 8.2 Name three (3) effects of using sands containing chlorides in concrete. (3)
- 8.3 Name three (3) different types of rock. (3)

### **QUESTION 9** [15]

You are a safety officer working on a construction site. One of your responsibilities is to ensure that all staff that enter the construction site are trained in all safety aspects that the law requires. Three months into the contract there is an incident, whereby the formwork on a suspended floor slab collapses. Luckily, nobody is injured in the collapse, but you are now required to write a report focusing directly on the safety aspects of formwork and falsework for suspended floor slabs that could have been compromised. Discuss the issues that you might raise in the report.

### **QUESTION 10** [7]

- 10.1 List four (4) properties of shutter release oil. (4)
- 10.2 When shutters are not in use on a construction site, you must take special care to ensure that the shutters are not damaged. Discuss three (3) points that you should take into consideration when storing shutters.