UNIVERSITY OF JOHANNESBURG

PROGRAM	:	BACCALAUREUS INGENERIAE *CIVIL ENGINEERING*
SUBJECT	:	**CONCRETE TECHNOLOGY 1B**
CODE	:	**BTK1B21 & BTKCIB1**
DATE	:	SUMMER SUPPLEMENTARY EXAMINATION DECEMBER 2019
DURATION	:	3 HOURS
WEIGHT	:	50 : 50
TOTAL MARKS	:	100

ASSESSOR	:	MR J J BESTER
MODERATOR	:	MR D KRUGER Pr Eng (UJ)
NUMBER OF PAGES	:	3 PAGES

INSTRUCTIONS	:	CALCULATORS MAY BE USED.
	:	SHOW **ALL** CALCULATIONS.
	:	STATE **ALL** ASSUMPTIONS.
REQUIREMENTS	:	QUESTION PAPERS MUST BE HANDED IN WITH THE ANSWER SHEET.

INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

QUESTION 1 **[18]**

1.1 You are an engineer working for BNM Contractors. Your company has been awarded a contract to construct a multi-storey office block in Pietermaritzburg. BNM Contractors wants you to use their oldest batch plant on the project. You want to get the company to buy a new computerised batch plant for the project. Using the following values, calculate the difference in the target mean strengths between the two batch plants. (4)

Specified compressive strength = 30MPa
Standard deviation of old batch plant = 6,2
Standard deviation of new computorised batch plant = 3,7
k-value = 1,7

1.2 You are to cast blinding concrete for a structure of dimensions:
Length: 30 meter
Breadth: 20 meter
Depth: 60 millimeter

The ratio to be used is 1 : 2,7 : 2,5 (cement : sand : stone). Calculate the number of bags of cement that will be used, as well as the volume of sand and stone that must be ordered in order to cast the blinding concrete. (14)

QUESTION 2 **[10]**

Compare plastic settlement cracking to plastic shrinkage cracking.

QUESTION 3 **[10]**

3.1 After completing the compressive strength test on concrete cubes, there are three (3) acceptable modes of failure. Sketch the acceptable failure modes. (3)

3.2 Sketch the relationship between concrete strength, and its age up to 1 year, for a 38MPa specified compressive strength concrete. (7)

QUESTION 4 **[14]**

4.1 List six (6) scenarios against which fresh concrete should be protected. (6)

4.2 Between volume batching and mass batching, which one will give you the most consistent concrete? Explain why. (3)

4.3 Sketch the acceptance criteria for less than 30 valid compressive strength results. (5)

QUESTION 5 [10]

Discuss spalling of steel reinforced concrete due to carbonation fully. (10)

QUESTION 6 [20]

6.1 Sketch the heat of hydration relationship of concrete. (8)
6.2 List four (4) advantages and four (4) disadvantages of using condensed silica fume in concrete. (8)
6.3 Describe the difference between fly ash and slag. (4)

QUESTION 7 [18]

7.1 Define a chemical admixture. (3)
7.2 Name three (3) impurities that can be found in the mixing water of concrete. (3)
7.3 Curing remains one very important aspect of acceptable site practice in order to achieve good quality concrete. List four (4) methods of *moist* curing that could be used on a construction site. (4)
7.4 There is three stages through which concrete developes, namely fresh, green and hardened. Discuss what should happen to concrete during each of these stages. (6)
7.5 Discuss why water should never be added to ready-mix concrete on the construction site by the contractor. (2)

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