



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019**

COURSE NAME : CIVIL ENGINEERING MATERIALS
COURSE CODE : BFC 10502
PROGRAMME CODE : BFF
EXAMINATION DATE : DECEMBER 2018/JANUARY 2019
DURATION : 2 HOURS
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS ONLY

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THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

- Q1** (a) The quality of fresh and hardened concrete is influenced by physical properties of aggregate. Define **FIVE (5)** physical properties of aggregate. (5 marks)
- (b) Name and briefly explain the chemical compound of Portland cement based on the abbreviation given.
- (i) C₂S
 - (ii) C₃S
 - (iii) C₃A
 - (iv) C₄AF
- (8 marks)
- (c) Complete the data in **Table 1** and determine the fineness modulus of the fine aggregate tested.

Table 1: Result of sieve analysis

BS410 Sieve size (mm)	Weight of aggregate retained (g)	Percentage retained	Cumulative percentage retained	Cumulative percentage passing
5.00	0			
2.36	31			
1.18	41			
0.60	43			
0.30	45			
0.15	34			
Pan	6			

(12 marks)

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- Q2** (a) Discuss the comparison for each statement below in which parameter will give the higher strength of the concrete.
- (i) Water-cement ratio of 0.5 vs. 0.35 (3 marks)
 - (ii) Using test cylinder of size 150 x 300 mm vs. 75 x 150 mm (3 marks)
 - (iii) Using a compression test loading rate of 3 MPa/s vs. 0.3 MPa/s (3 marks)
- (b) (i) Explain the relationship between compressive strength and tensile strength in concrete. (3 marks)
- (ii) Calculate the maximum load applied to concrete cylinder (diameter 100 mm x length 200 mm) when the splitting tensile value is 7.5MPa. (3 marks)
- (c) Sketch the typical stress-strain curve for concrete. Elaborate on various elastic modulus of concrete. (10 marks)
- Q3** (a) State **THREE (3)** types of clay that are commonly used in brick industry. (3 marks)
- (b) A severe weathering clay brick was tested for absorption and saturation coefficient according to ASTM C67 procedure and the tests produced the following data:
- Dry mass specimen = 1.811 kg
Saturated mass after 24 hour submersion in cold water = 2.022 kg
Saturated mass after 5 hour submersion in boiling water = 2.040 kg
- (i) Calculate absorption by 24 hours submersion in cold water and 5 hours boiling. (4 marks)
 - (ii) Define the saturation coefficient for this clay brick. (2 marks)
 - (iii) Proof that the brick satisfiest the ASTM requirement. (1 mark)

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- (c) Justify the importance of concrete masonry unit when it meets certain absorption requirement. (3 marks)

- (d) A concrete masonry unit was tested according to ASTM C140 procedure, and the test produced the following results :

Mass of unit as received = 10.333 g
Saturated mass of unit = 11.066 g
Oven dry mass of unit = 9.844 g

Determine the followings:

- (i) percentage of absorption. (2 marks)
- (ii) moisture content of the unit as a percent of total absorption. (2 marks)
- (e) List **THREE (3)** functions of mortar in masonry works. (3 marks)
- (f) Give **FIVE (5)** main factors that influence the strength of brick wall. (5 marks)

- Q4** (a) Justify **FOUR (4)** differences between hardwood and softwood properties. (8 marks)
- (b) Identify **TWO (2)** advantages and **TWO (2)** disadvantages of using timber as a construction material. (4 marks)
- (c) Indicate **THREE (3)** methods to determine the timber standard testing and its importance for construction. (6 marks)
- (d) Draw and specify cambium and pith in wood formation. (7 marks)

- Q5** (a) Describe **FOUR (4)** classifications of steel. (4 marks)
- (b) State **FOUR (4)** differences between mild steel and high carbon steel. (8 marks)

- (c) Elaborate the operation involved in Bessemer process and sketch the diagram of Bessemer converter. (8 marks)
- (d) As an engineer of Quality Assurance in steel factory, you are assigned to determine the hardenability of steel. Discuss the properties of hardenability. (5 marks)

- END OF QUESTIONS -

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