UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME : CIVIL ENGINEERING MATERIALS

COURSE CODE : DAC 11503

PROGRAMME : DAA

EXAMINATION DATE : DECEMBER 2019/ JANUARY 2020

DURATION : 3 HOURS

INSTRUCTION : ANSWER ANY **FIVE (5)** QUESTIONS

TERBUKA

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Name **two (2)** basic raw ingredients for manufactured cement.

(2 marks)

(b) Explain the different between 'setting' and 'hardening' of cement.

(4 marks)

(c) Describe the properties of the following cement types.

(i)   Low Heat Portland Cement
(ii) Portland Blast Furnace Cement

(6 marks)

(d) The compressive strength of concrete cannot be predicted accurately from mortar cube strength. Explain this statement.

(2 marks)

(e) Sketch and label the following processes in the manufacturing of cement.

(i)   Dry Process
(ii) Wet Process

(6 marks)

Q2 (a) Describe the uniform gradation of aggregate.

(2 marks)

(b) Determine the specific gravity of high density aggregate which the unit weight is 2800 kg/m^3. Given the density of water = 1000 kg/m^3.

(2 marks)

(c) Sketch the void and moisture absorption of the following aggregates.

(i)   Semi Saturated Dry (SSD)
(ii)   Bone Dry
(iii) Air Dry
(iv)   Moist

TERBUKA

(8 marks)

(d) **Table 1** shows the result of sieve analysis of an aggregates samples. Calculate,

(i)   Percentage of retained and cummulative percentage of retained.

(5 marks)

(ii) Fineness Modulus

(2 marks)

CONFIDENTIAL

Q3 (a) State **five (5)** stages of DOE concrete design method.

(5 marks)

(b) Consider the 28-day compressive strength should be 40 MPa and the concrete mix design using the following properties.

Concrete mix grade 30 with compressive strength at 28 days
Water/cement ratio = 0.5
Slump required = 0 - 10 mm
Max. Aggregate size = 10 mm
Coarse aggregate crushed (10 mm)
Fine aggregate crushed (80% pass 600 microns)
Volume occupy by aggregate = 0.720
Cement Density γ_C = 3150 kg/m^3
Unit weight of aggregate = 2700 kg/m^3

Based on the DOE concrete mix design method, determine:

(i) Total aggregate content

(3 marks)

(ii) Total fine aggregate content (Refer **Figure Q3(b)**)

(4 marks)

(iii) Total coarse aggregate content

(2 marks)

(c) Sketch the following type of slump with short description.

(i) Collapsed slump
(ii) Shear slump
(iii) Zero slump

(6 marks)

Q4 (a) Define the following terms.

(i) Common Brick
(ii) Facing Brick

(4 marks)

(b) Sketch the following types of bricks bonding and joint.

(i) Strecher/Running Bound
(ii) Flemish Bond
(iii) Flush Joint

TERBUKA

(6 marks)

CONFIDENTIAL

(c)   Compare the severe, moderate and negligible grades of building bricks in term of compressive strength and water absorption.

(6 marks)

(d)   Given a brick with dimension of 60 mm thickness, 120 mm width and 230 mm long acted on by the load of 25 kN at the middle of the span. The span length is 200 mm.

(i)   Sketch the diagram of the brick with the load

(2 marks)

(ii)   Calculate the modulus of rupture of the brick (in MPa)

(2 marks)

Q5   (a)   Describe **two (2)** properties with **one (1)** example for each of the following types of wood.

(i)   Softwood
(ii)   Hardwood

(6 marks)

(b)   Wood formation generally consists of bark, cambium, sapwood, heartwood and pitch, where every parts of formation contains its own function. Describe **two (2)** functions of each sapwood and heartwood.

(4 marks)

(c)   Annual rings only grow in temperature climates since the vigour of growth during a single growing season is not uniform throughout. Illustrate the details of the annual ring formation with proper label as explanation.

(6 marks)

(d)   One of the factors affecting strength of timber is defect. Illustrate **four (4)** types of timber defect.

(4 marks)

Q6   (a)   Explain the effect of carbon content in steel in term of strength and workability.

(2 marks)

(b)   Explain the basic method in making steel. TERBUKA

(4 marks)

(c)   Illustrate the converter used in basic method mentioned in **Q6(b).**

(4 marks)

(d)   Lintz and Donawitz process is one of the latest steelmaking processes. Describe **two (2)** advantages of this process.

(e)   An alloy is a mixture of metals or a mixture of a metal and another element. Alloys are defined by a metallic bonding character. Briefly describe the type of metal used to produce and the usage of the following alloys

(i)   Bronze
(ii)   Pewteer
(iii)   Precipitation - Hardening

(6 marks)

- END OF QUESTION -

CONFIDENTIAL

FINAL EXAMINATION

SEMESTER / SESSION   : SEM 1 / 2019/2020   PROGRAM :   DAA
COURSE : CIVIL ENGINEERING MATERIALS   COURSE CODE : DAC 11503

LIST OF TABLE, FIGURE AND FORMULA

Table 1 : The result of sieve analysis for aggregate

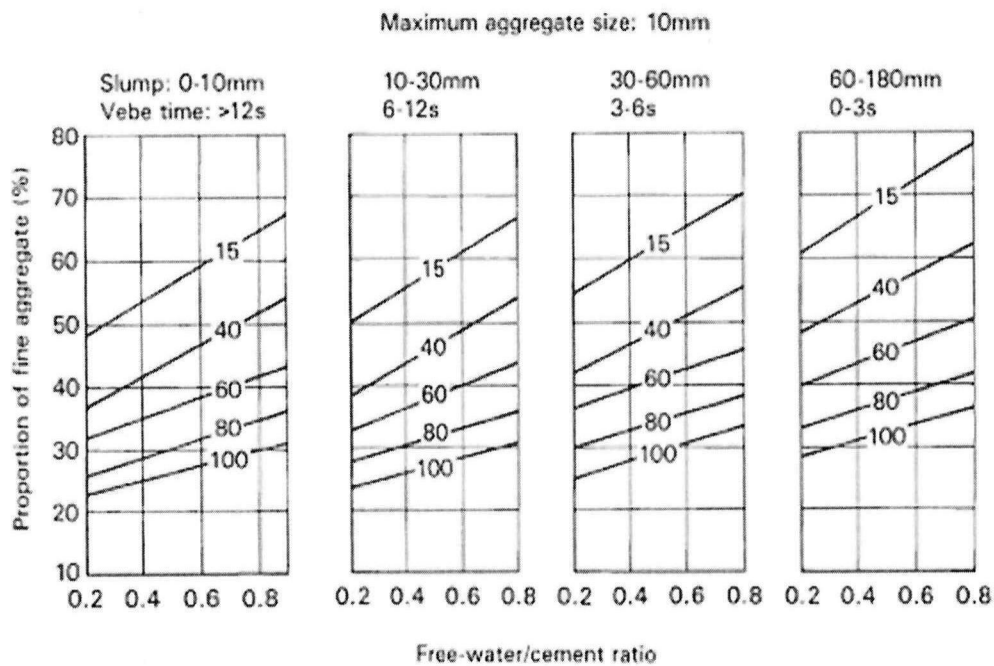| Sieve Size (mm)	Mass of Retained (kg)
25	120
19	265
12.5	887
9.5	1320
4.75	752
2.3	338
1.18	216
Pan	102

Maximum aggregate size: 10mm

Figure Q3(b): Recommended proportions of fine aggregate according to percentage passing 600 micron sieve (d_{max} 10 mm)

FORMULA: $MOR = \dfrac{1.5Pl}{Bt^2}$

TERBUKA