Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	CONCRETE TECHNOLOGY
COURSE CODE	:	BFS40603
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JUNE/JULY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

TERBUKA

Q1 (a) Define durability of concrete.

(2 marks)

(b) State which pores influence the permeability of concrete.

(3 marks)

(c) Relates the influence of water/cement ratio and age on concrete permeability and durability.

(10 marks)

(d) Elaborate in detail the corrosion of steel in concrete subject to carbonation.

(10 marks)

Q2 (a) Describe the meaning of structural lightweight concrete.

(2 marks)

(b) Indicate the differences between lightweight concrete and lightweight aggregate concrete.

(3 marks)

(c) Various types of lightweight concrete can be classified by their method of production. Categorize these classfications.

(10 marks)

(d) Argue on the effect of density and moisture content on thermal conductivity of concrete.

(10 marks)

Q3 (a) Give the diffence between an additive and an admixture.

(2 marks)

(b) Explain the advantages of implementing high strength concrete in tall buildings and bridge.

(3 marks)

(c) Discover the advantages of using pulverised fuel ash (PFA) or slag in concrete.

(10 marks)

(d) Evaluate the effects of incorporating fibres in concrete.

(10 marks)

TERBUKA

Q4 (a) Corrosion in concrete can be controlled following several methods. Report on **THREE (3)** ways of minimizing corrosion of embedded steel in concrete.

(10 marks)

(c) Calculate a concrete mix using the Design of Experiments (DoE) method to meet the following requirements,

- characteristics compressive strength 45 N/mm^2 at 28 days
- ordinary Portland cement is specified
- a slump of 90 mm is needed to meet the requirement.
- coarse aggregate: crushed, maximum size = 20 mm
- fine aggregate: uncrushed, 45% passing 600μm sieve
- relative density of the combined aggregate is 2.7
- maximum cement content 450kg/m^3

Assume 2.5% defective rate with a constant 1.96 and a standard deviation of 5N/mm^2. Use and complete the mix design form supplied. Obtain the quantities required for a trial mix of 0.05m^3

(15 marks)

– END OF QUESTIONS –

TERBUKA

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2018/2019 PROGRAMME CODE : 4 BFF
COURSE NAME : CONCRETE TECHNOLOGY COURSE CODE : BFS40603

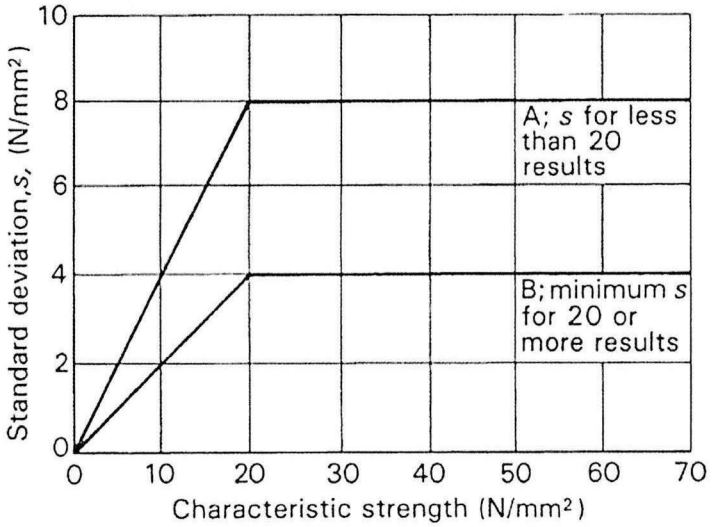

Figure 3
Relationship between standard deviation and characteristic strength

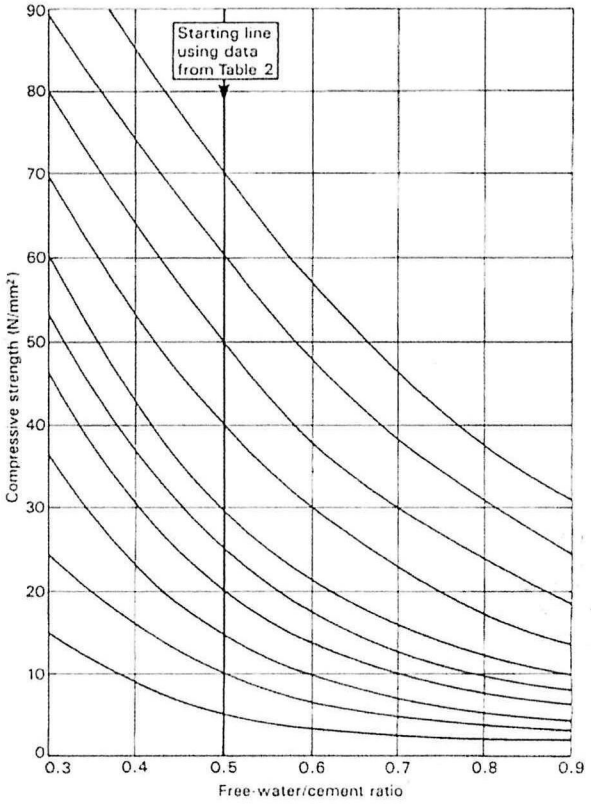

Figure 4
Relationship between compressive strength and free-water/cement ratio

TERBUKA

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2018/2019
COURSE NAME : CONCRETE TECHNOLOGY
PROGRAMME CODE : 4 BFF
COURSE CODE : BFS40603

Table 2 Approximate compressive strengths (N/mm^2) of concrete mixes made with a free-water/cement ratio of 0.5

Cement strength class	Type of coarse aggregate	Compressive strengths (N/mm^2) Age (days) 3	7	28	91
42.5	Uncrushed	22	30	42	49
	Crushed	27	36	49	56
52.5	Uncrushed	29	37	48	54
	Crushed	34	43	55	61

Throughout this publication concrete strength is expressed in the units N/mm^2.
$1\ N/mm^2 = 1\ MN/m^2 = 1\ MPa$ (N = newton; Pa = pascal)

Table 3 Approximate free-water contents (kg/m^3) required to give various levels of workability

Slump (mm)		0–10	10–30	30–60	60–180
Vebe time (s)		>12	6–12	3–6	0–3
Maximum size of aggregate (mm)	Type of aggregate				
10	Uncrushed	150	180	205	225
	Crushed	180	205	230	250
20	Uncrushed	135	160	180	195
	Crushed	170	190	210	225
40	Uncrushed	115	140	160	175
	Crushed	155	175	190	205

TERBUKA

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2018/2019
COURSE NAME : CONCRETE TECHNOLOGY
PROGRAMME CODE : 4 BFF
COURSE CODE : BFS40603

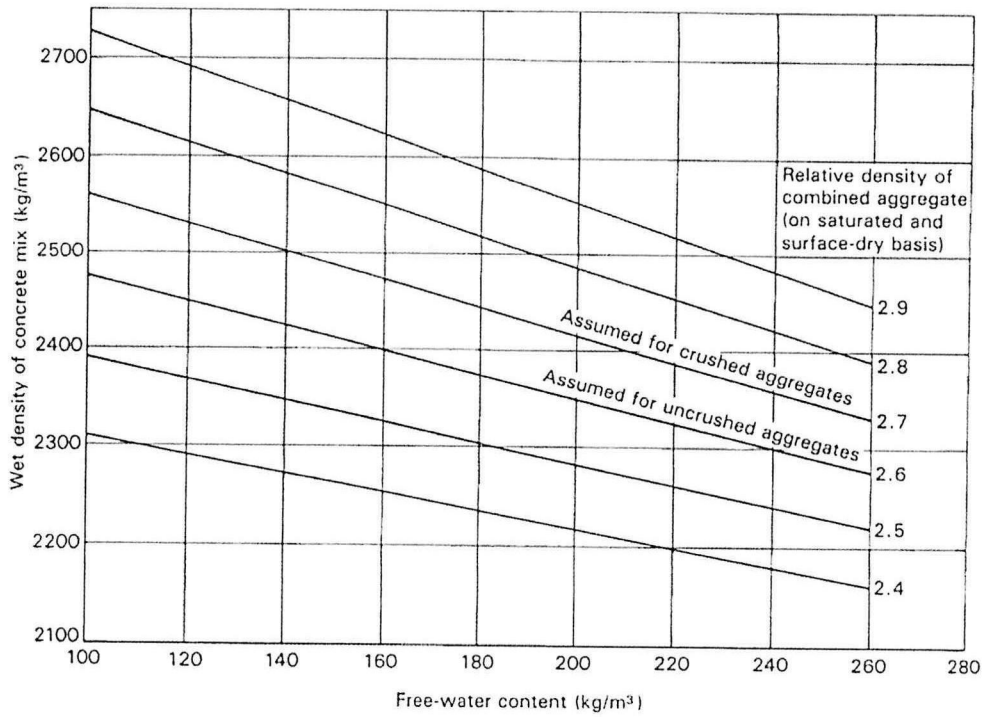

Figure 5 Estimated wet density of fully compacted concrete

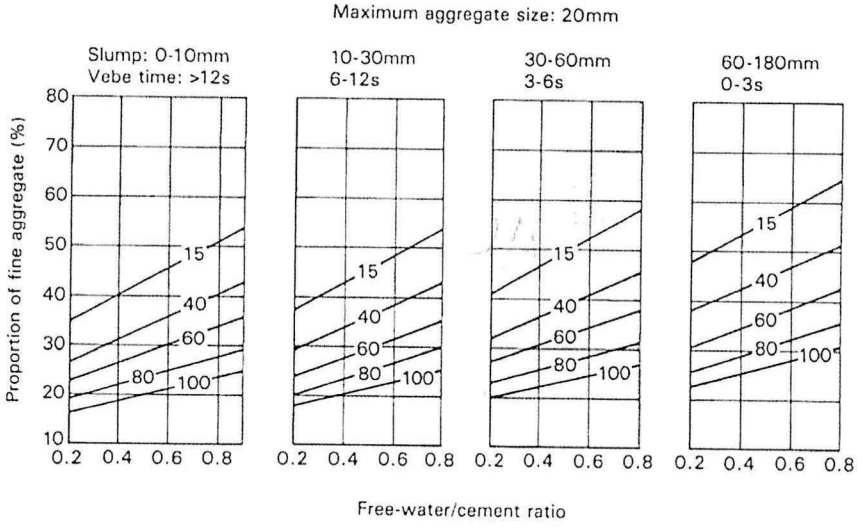

Figure 6 (continued)

TERBUKA