(1)

BBA in TM, 3rd Sem. **03 October, 2023 (Morning)**

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

TERM : MID SEMESTER EXAMINATION WINTER SEMESTER: 2022-2023
COURSE NO. : CEE 4361 TIME : 1.5 Hours
COURSE TITLE : Civil and Environmental Technology I FULL MARKS : 75

There are 3 (Three) questions. Answer all questions. Programmable calculators are not allowed. Do not write on this question paper. The figures in the right margin indicate full marks, CO, and PO. The symbols have their usual meaning.

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1. The sieve analysis data of a sand sample and stone aggregate sample for a construction work are given below: **(27)** (CO2) (PO2)

ASTM Sieve	Sand Material Retained (g)	Stone aggregate Material Retained (g)
3 inch	0	0
1.5 inch	0	0
¾ inch	0	200
3/8 inch	0	950
#4	0	2500
#8	80	900
#12	75	0
#16	0	0
#30	60	0
#40	50	0
#50	60	0
#100	40	0
#200	10	0
Pan	70	50

(i) Calculate the fineness modulus (FM) for the sand and stone aggregate samples,

(ii) Draw the grading curves for the samples in one graph,

(iii) Make a brief discussion on the FM and grading curves based on technical perspective.

2. Mixture proportion of mortar is necessary for plastering work of a brick wall. The following data are provided: **(24)** (CO3) (PO3)

S/C (weight ratio) = 2.5:1; W/C (weight ratio) = 1:2; Specific gravity of cement = 3.0; Specific gravity of sand = 2.5; Air content = 1.5%; Unit weight of cement (with void) = 1400 kg/m^3; Unit weight of sand (with void) = 1350 kg/m^3.

(i) Calculate the unit contents of sand, cement, and water,
(ii) Calculate the cost of materials for 1 cubic meter of mortar (assume cost for 1 m^3 of sand = 1750 TK, cost for 50 kg of cement = 500 TK, cost for 100 L of water = 10 TK),
(iii) Calculate the unit weight of mortar,
(iv) Calculate the volumetric ratio of cement and sand,
(v) Calculate compaction factor,
(vi) Mention two measures that can be taken to increase the compressive strength of the mortar.

3. (a) Compare briefly between amorphous and crystalline materials. Give an example of each of these materials. (4) (CO1) (PO1)

(b) Compare between low-alloy steel bar and carbon-steel bar based on their ductility, weldability and corrosion resistance. (4) (CO1) (PO1)

(c) "Around 1 ton of CO_2 is produced during 1 ton of Portland cement production" – justify. (4) (CO1) (PO1)

(d) What is unsoundness of cement? How does fineness of cement influence the strength of mortar? (4) (CO1) (PO1)

(e) Why are alkalis and iron pyrites not desirable in the clay used to produce brick? (4) (CO1) (PO1)

(f) Compare briefly among CEM I, CEM II/A-M, CEM II/B-M and CEM V/B cements. Which type of cement is more environmentally friendly? (4) (CO1) (PO1)

Tabl Traditional American and British Sieve Sizes

Aperture mm or μm	Approximate Imperial equivalent in.	Previous designation of nearest size	
		BS	ASTM
125 mm	5	—	5 in.
106 mm	4.24	4 in.	4.24 in.
90 mm	3.5	$3\frac{1}{2}$ in.	$3\frac{1}{2}$ in.
75 mm	3	3 in.	3 in.
63 mm	2.5	$2\frac{1}{2}$ in.	$2\frac{1}{2}$ in.
53 mm	2.12	2 in.	2.12
45 mm	1.75	$1\frac{3}{4}$ in.	$1\frac{3}{4}$ in.
37.5 mm	1.50	$1\frac{1}{2}$ in.	$1\frac{1}{2}$ in.
31.5 mm	1.25	$1\frac{1}{4}$ in.	$1\frac{1}{4}$ in.
26.5 mm	1.06	1 in.	1.06
22.4 mm	0.875	$\frac{7}{8}$ in.	$\frac{7}{8}$ in.
19.0 mm	0.750	$\frac{3}{4}$ in.	$\frac{3}{4}$ in.
16.0 mm	0.625	$\frac{5}{8}$ in.	$\frac{5}{8}$ in.
13.2 mm	0.530	$\frac{1}{2}$ in.	0.530 in.
11.2 mm	0.438	—	$\frac{7}{16}$ in.
9.5 mm	0.375	$\frac{3}{8}$ in.	$\frac{3}{8}$ in.
8.0 mm	0.312	$\frac{5}{16}$ in.	$\frac{5}{16}$ in.
6.7 mm	0.265	$\frac{1}{4}$ in.	0.265 in.
5.6 mm	0.223	—	No. $3\frac{1}{2}$
4.75 mm	0.187	$\frac{3}{16}$ in.	No. 4
4.00 mm	0.157	—	No. 5
3.35 mm	0.132	No. 5	No. 6
2.80 mm	0.111	No. 6	No. 7
2.36 mm	0.0937	No. 7	No. 8
2.00 mm	0.0787	No. 8	No. 10
1.70 mm	0.0661	No. 10	No. 12
1.40 mm	0.0555	No. 12	No. 14
1.18 mm	0.0469	No. 14	No. 16
1.00 mm	0.0394	No. 16	No. 18
850 μm	0.0331	No. 18	No. 20
710 μm	0.0278	No. 22	No. 25
600 μm	0.0234	No. 25	No. 30
500 μm	0.0197	No. 30	No. 35
425 μm	0.0165	No. 36	No. 40
355 μm	0.0139	No. 44	No. 45
300 μm	0.0117	No. 52	No. 50
250 μm	0.0098	No. 60	No. 60
212 μm	0.0083	No. 72	No. 70
180 μm	0.0070	No. 85	No. 80
150 μm	0.0059	No. 100	No. 100
125 μm	0.0049	No. 120	No. 120
106 μm	0.0041	No. 150	No. 140
90 μm	0.0035	No. 170	No. 170
75 μm	0.0029	No. 200	No. 200
63 μm	0.0025	No. 240	No. 230
53 μm	0.0021	No. 300	No. 270
45 μm	0.0017	No. 350	No. 325
38 μm	0.0015	—	No. 400
32 μm	0.0012	—	No. 450