COPY your answers for Question 1 to the following table:

Question	Answer
1	
2	
3	
4	
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12	
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14	
15	

Course No: CVL 2407
Course Title: Concrete Technology
Date: 28/05/2015
No. of Questions: (2)
Time: 90 minutes
Using Calculator (Yes)

University of Palestine

Final Exam
2014/2015
Total Grade: 50

Instructor Name: Dr. Osama Dawoud
Student No.: _____
Student Name: _____
College Name: _____
Dep. / Specialist: _____
Using Dictionary (No)

Question One: Choose the correct answer   30

1. Which of the following can be used as the main source for the **calcium oxide (CaO)** during the manufacturing of the Ordinary Portland Cement?
   A. Clay
   B. Limestone
   C. Hematite
   D. All of the above

2. Gypsum is added to the Portland Cement during manufacturing in order to:
   A. Prevent flash-setting
   B. Facilitate the early strength of concrete
   C. Reduce water content
   D. None of the above

3. Which of the following can be blamed for the **false setting?**
   A. High C_2S content
   B. Storing cement in a humid place before being used
   C. Formation of ettringite in large quantities during hydration
   D. The low w/c ratio

4. Which of the following can be employed to reduce bleeding of fresh concrete:
   A. Using more fine aggregates
   B. Using well graded aggregates
   C. Increasing the entrained air
   D. Reducing water content
   E. All of the above
   F. None of the above

5. Chemically-combined water in the cement paste:
   A. Is released only when the components of cement paste are thermally decomposed
   B. Present in the paste adsorbed to the gel surface
   C. Represents 23% of the total water added to the dry cement
   D. None of the above

6. Increasing the fineness of the cement:
   A. Increases workability of concrete
   B. Increases water demand of the cement paste
   C. Induces faster hydration rates
   D. All of the above
   E. None of the above

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7. Which of the following **increases workability** of fresh concrete:
   A. Decreasing the w/c ratio
    B. Using rounded aggregate rather than the crushed ones
    C. Using set-accelerating admixtures
    D. Using cement of low fineness

8. Which of the following can be said about C_3A:
    A. It increases cement paste resistance to sulfate attack
    B. Its hydration releases high energy compared to other components of cement
    C. It reacts with water and produces C-S-H gel.
    D. All of the above

9. The attached figure represents SEM of an Ordinary Portland Cement Paste. **The plate-shaped crystals** are:
    A. Tricalcium alluminate
   B. Calcium carbonate
    C. Calcium hydroxide
    D. C-S-H gel
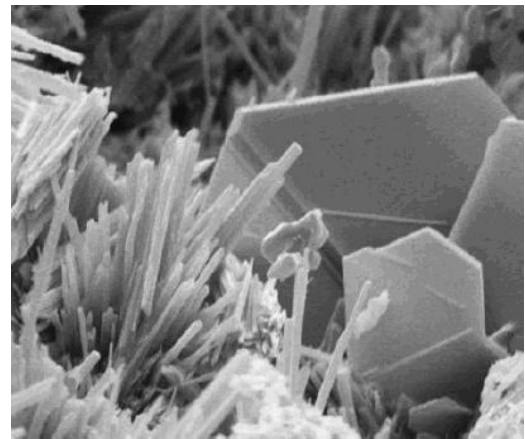
10. If a sample of hardened mortar was heated-up in a container until large amounts of CO_2 gas were released, this means that:
    A. The heat made the sample to hydrate faster
    B. Only the capillary water evaporated from the sample
    C. The gel started to decompose into its composing oxides
    D. The sand which was used to prepare the sample contains large amounts of silica

11. A reinforced-concrete structural element is to be constructed using the framework shown in the attached figure. Concrete has two levels as shown by dashed lines. According to the ASTM, what is the Maximum Aggregate Size:

    A. 52 mm
    B. 40 mm
    C. 33 mm
    D. 22.5 mm
    E. 17 mm
    F. 10 mm
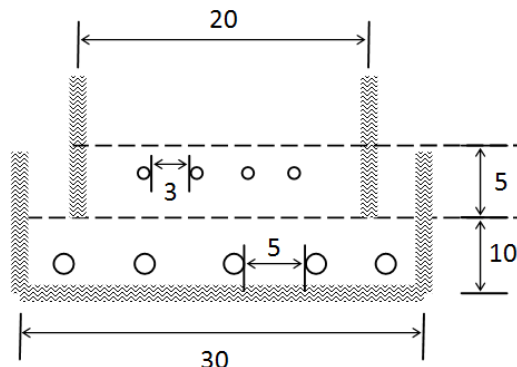
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12. A cement paste was tested for the initial setting time using Vicat apparatus. At 20 min, penetration was 37 mm. At 30 min, penetration was 32 mm. Accordingly, initial setting time is:
    A. 30 min
    B. 34 min
    C. 26 min
    D. 25 min
    E. None of the above

13. The following figure represents the aggregate size distribution of an aggregate sample. According to the figure, the fineness modulus is (Note that standard sieves used for the calculations of FM are shown by the white circles):

    A. 3.27
    B. 4.73
    C. 6.31
    D. 3.10
    E. 2.40
    F. 1.00
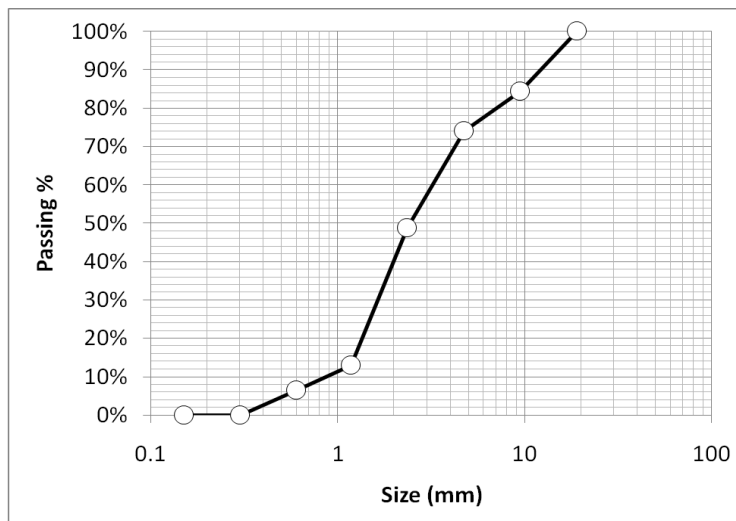
14. Which of the following is the correct shape of failure of indirect tensile strength test if a cylindrical specimen was used?

    A.

    B.

    C.

    D.

    E. None of the above

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15. The transition zone between aggregates and cement paste usually:
   A. Refers to the transition of the cement behavior from the elastic to the plastic one.
    B. Represents the strongest zone in the concrete
    C. Contains a high content of the C-S-H gel
    D. All of the above
    E. None of the above

Question Two: Mix Design   20

A concrete mix is to be designed for use in a <u>300 mm thick slab with no reinforcement</u>. Design the concrete mix according to the <u>ACI method</u> OR <u>the British Standard Method</u> according to the following:
- Required slump of 75 mm.
- Required Average 28-day UCS 34.5 MPa
- Aggregates are crushed
- Coarse aggregate:
    o nominal maximum size = (20.0 mm if you use British standard method)
    o nominal maximum size = (19.0 mm if you use ACI method)
    o dry-rodded weight = 1650 kg/m^3,
    o specific gravity = 2.68,
    o moisture content = 0.1%
    o absorption = 0.5%
- Fine aggregate:
    o fineness modulus = 2.5,
    o specific gravity = 2.68,
    o moisture content = 5%,
    o absorption = 0.7%
    o Percentage passing sieve 600μm = 50%.
- No air-entrainment is required
- Maximum allowable water-cement ratio = 0.44
- Minimum cement content = 335 kg
- Density of water = 1000 kg/m^3
- Specific gravity of Portland cement = 3.15

Show your chosen values on the attached tables and figures

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مع تمنياتنا لكم بالنجاح والتوفيق

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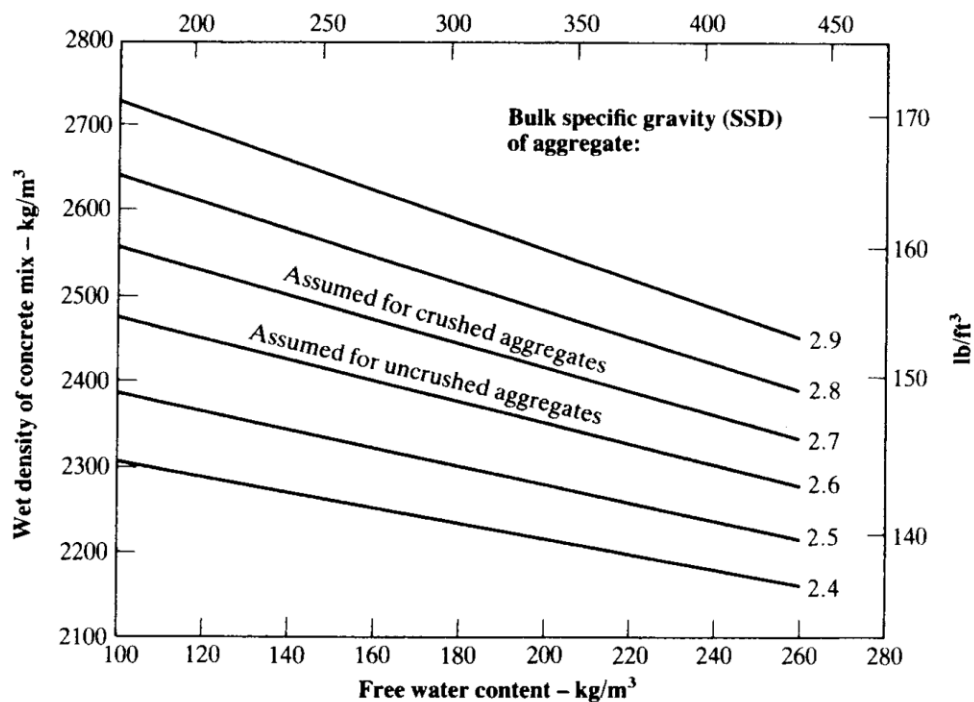
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Using Dictionary (No)

Aggregate		Water content kg/m³ (lb/yd³) for:				
Max. size mm (in.)	Type	Slump mm (in.)	0–10 $(0-\frac{1}{2})$	10–30 $(\frac{1}{2}-1)$	30–60 $(1-2\frac{1}{2})$	60–180 $(2\frac{1}{2}-7)$
		Vebe *s*	>12	6–12	3–6	0–3
10 $(\frac{3}{8})$	Uncrushed		150 (255)	180 (305)	205 (345)	225 (380)
	Crushed		180 (305)	205 (345)	230 (390)	250 (420)
20 $(\frac{3}{4})$	Uncrushed		135 (230)	160 (270)	180 (305)	195 (330)
	Crushed		170 (285)	190 (320)	210 (355)	225 (380)
40 $(1\frac{1}{2})$	Uncrushed		115 (195)	140 (235)	160 (270)	175 (295)
	Crushed		155 (260)	175 (295)	190 (320)	205 (345)

B.S. Method

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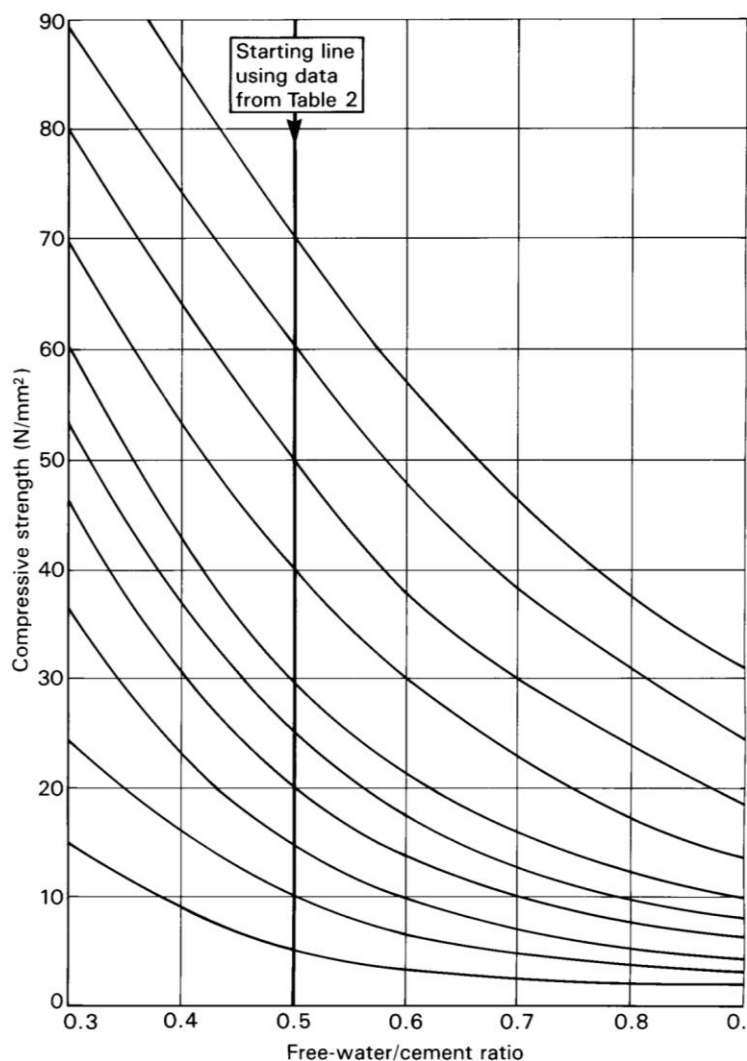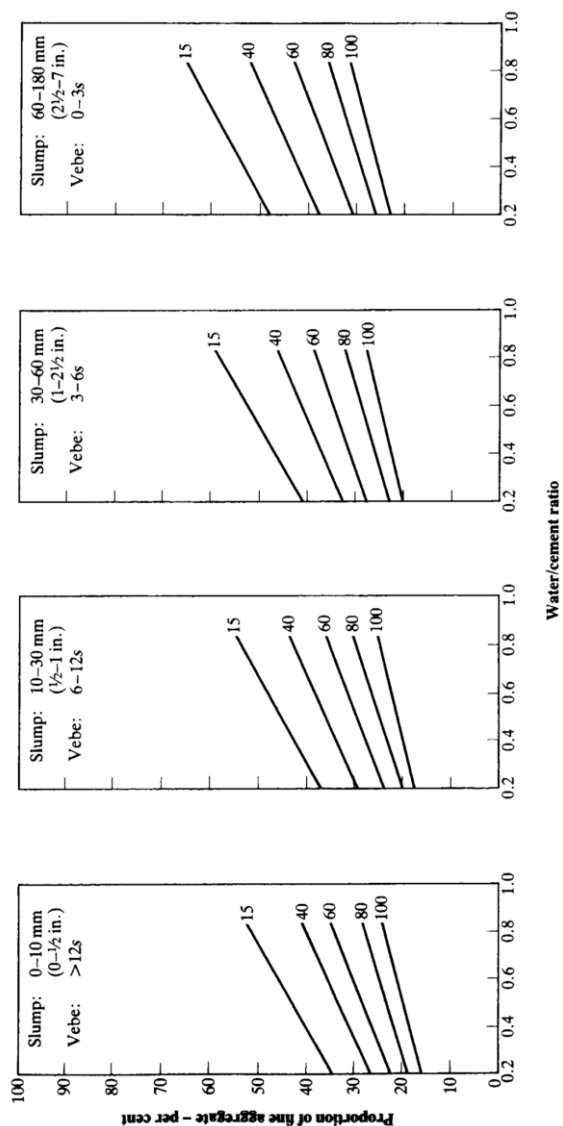**Using Dictionary (No)**

B.S. Method

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Using Dictionary (No)

Slump	Mixing Water Quantity in kg/m³ (lb/yd³) for the listed Nominal Maximum Aggregate Size							
	9.5 mm (0.375 in.)	12.5 mm (0.5 in.)	19 mm (0.75 in.)	25 mm (1 in.)	37.5 mm (1.5 in.)	50 mm (2 in.)	75 mm (3 in.)	100 mm (4 in.)
Non-Air-Entrained								
25 - 50 (1 - 2)	207 (350)	199 (335)	190 (315)	179 (300)	166 (275)	154 (260)	130 (220)	113 (190)
75 - 100 (3 - 4)	228 (385)	216 (365)	205 (340)	193 (325)	181 (300)	169 (285)	145 (245)	124 (210)
150 - 175 (6 - 7)	243 (410)	228 (385)	216 (360)	202 (340)	190 (315)	178 (300)	160 (270)	-
Typical entrapped air (percentage)	3	2.5	2	1.5	1	0.5	0.3	0.2
Air-Entrained								
25 - 50 (1 - 2)	181 (305)	175 (295)	168 (280)	160 (270)	148 (250)	142 (240)	122 (205)	107 (180)
75 - 100 (3 - 4)	202 (340)	193 (325)	184 (305)	175 (295)	165 (275)	157 (265)	133 (225)	119 (200)
150 - 175 (6 - 7)	216 (365)	205 (345)	197 (325)	184 (310)	174 (290)	166 (280)	154 (260)	-
Recommended Air Content (percent)								
Mild Exposure	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
Moderate Exposure	6.0	5.5	5.0	4.5	4.5	4.0	3.5	3.0
Severe Exposure	7.5	7.0	6.0	6.0	5.5	5.0	4.5	4.0

Nominal Maximum Aggregate Size	Fine Aggregate Fineness Modulus			
	2.40	2.60	2.80	3.00
9.5 mm (0.375 inches)	0.50	0.48	0.46	0.44
12.5 mm (0.5 inches)	0.59	0.57	0.55	0.53
19 mm (0.75 inches)	0.66	0.64	0.62	0.60
25 mm (1 inches)	0.71	0.69	0.67	0.65
37.5 mm (1.5 inches)	0.75	0.73	0.71	0.69
50 mm (2 inches)	0.78	0.76	0.74	0.72
75 mm (3 inches)	0.82	0.80	0.78	0.76
150 mm (6 inches)	0.87	0.85		

ACI Method

28-Day Compressive Strength in MPa (psi)	Water-cement ratio by weight	
	Non-Air-Entrained	Air-Entrained
41.4 (6000)	0.41	-
34.5 (5000)	0.48	0.40
27.6 (4000)	0.57	0.48
20.7 (3000)	0.68	0.59
13.8 (2000)	0.82	0.74