



University Of Technology  
Building and Construction Eng. Dept.  
Middle Exam – First Attempt – 2013/2014



Subject : Earth Structures

Class: 4<sup>th</sup> Year

Branch :Water & Dams

Time : 1.5 Hours

Examiner :Dr. Zeena Waleed Abbawi

Date : 21/1/2014

**Q1.A.** Show using figures only of the following: (Answer six only)

1. The effect of adding lime on the properties of clayey soils.
  2. Effect of curing time on strength of soil stabilized by lime.
  3. Effect of temperature increases on the (stability, water absorption & expansion) of soil stabilized with asphalt.
  4. The relationship between dry density & moisture content for different effective effort.
  5. The effect of adding bitumen on the (cohesion, permeability & swelling) of sandy loam soils.
  6. The relationship between cement content & unconfined compressive strength for different soils.
  7. The influence of ground freezing method on the shear strength parameters for normally consolidated clay.
  8. Effect of curing time on strength in terms of unconfined compressive strength for different soils stabilized with cement.
  9. The variation of dry unit weight with depth for any given number of roller passes.
- (30 marks)**

**Q1.B.** Define the compactive effort of the compacted soil & explain how it is measure for standard & modified Proctor tests.

**(10 marks)**

**Q2.A.** The following results were obtained from a standard compaction test on a soil,  $G_s = 2.67$ , the volume of mould is  $1000 \text{ cm}^3$

Mass (gm)	2012	2095	2116	2100	2056
Water Content %	13	15	16	17	14

- a. Plot the relationship between dry density & water content curve & find max. dry density & optimum water content.
- b. Plot the curve of 10% air content.
- c. find the value of air content at max. dry density.

**(20 marks)**

**Q2. B.** Discuss the mechanism of the following techniques: (Answer **Two** only)

- a- Stone Columns.
- b- Compaction & role of water.
- c- Earth Reinforcement.
- d- Deep Compaction using Vibratory Probs.

(10 marks)

**Q3.A.** Which type of soil can be stabilized by the following stabilizing method?

1. Compaction by explosives.
2. Lime stabilization.
3. Vacuum dewatering system.
4. Stone columns.
5. Vibratory Probs.
6. Cement stabilization.
7. Soil replacement techniques.
8. Sumps & Ditches.
9. Earth Reinforcement.
10. Thermal treatments.

(20 marks)

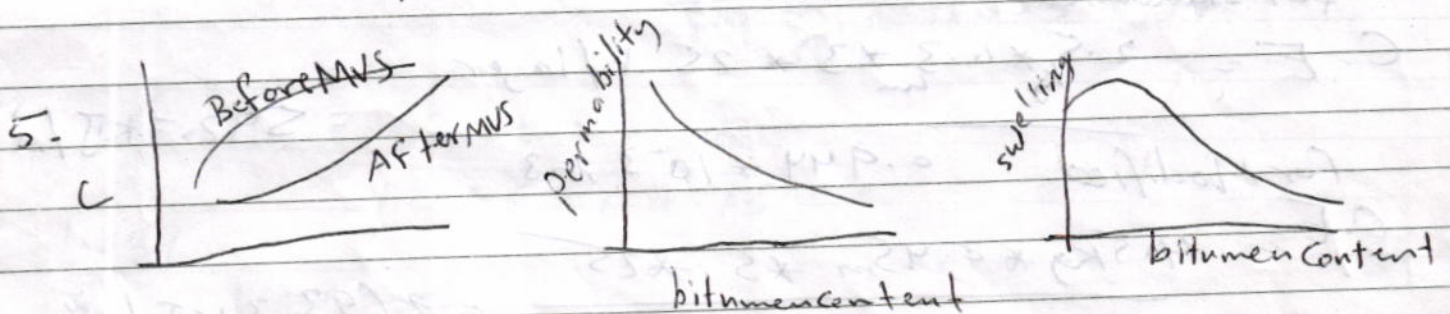
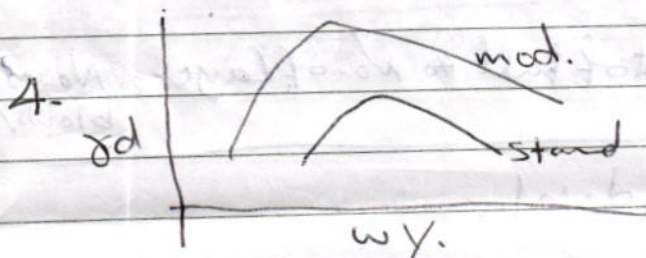
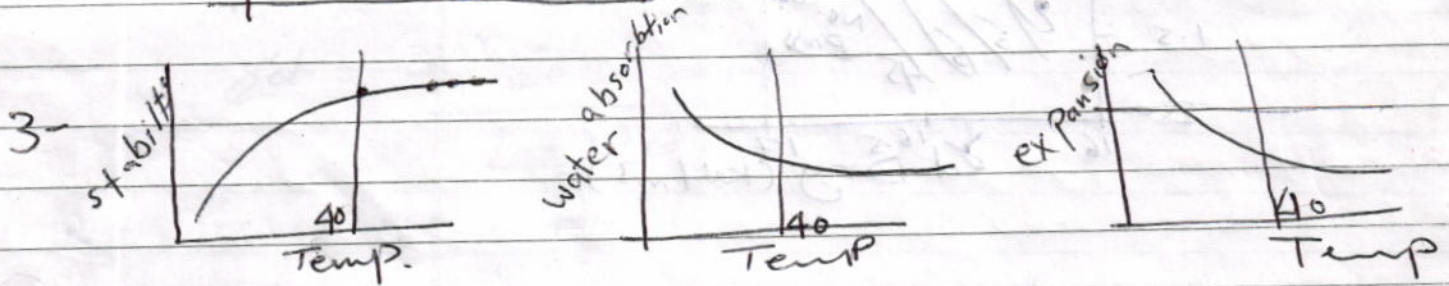
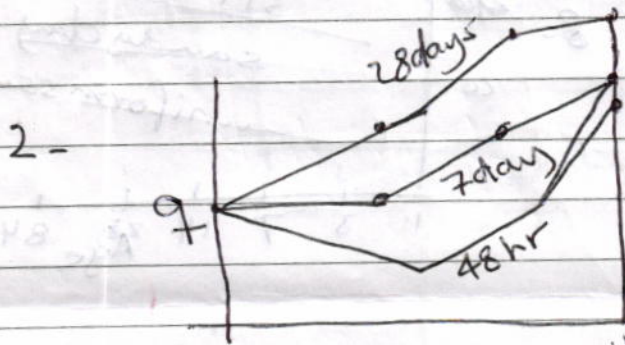
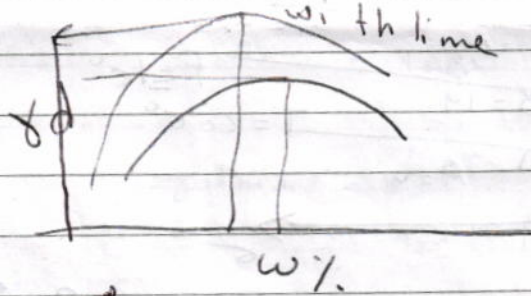
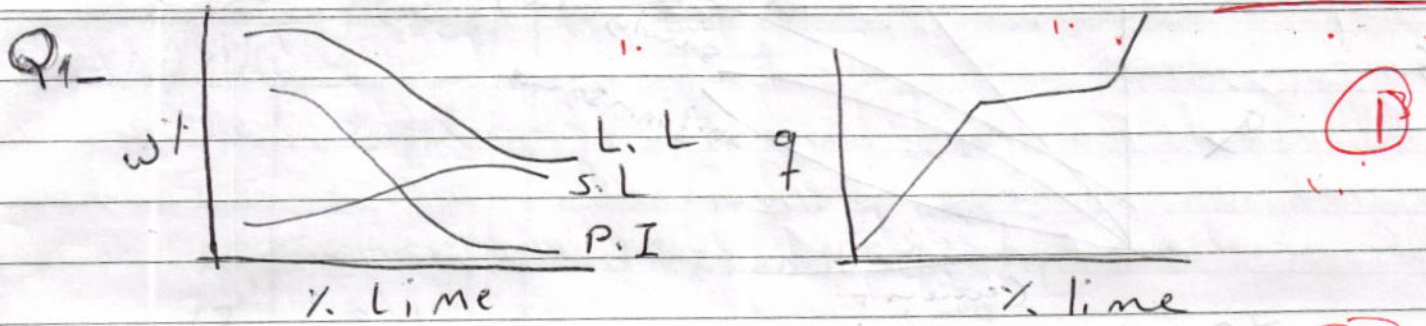
**Q3.B.** What are materials used for grouting techniques & what are points take into account when choosing anyone of them?

(10 marks)

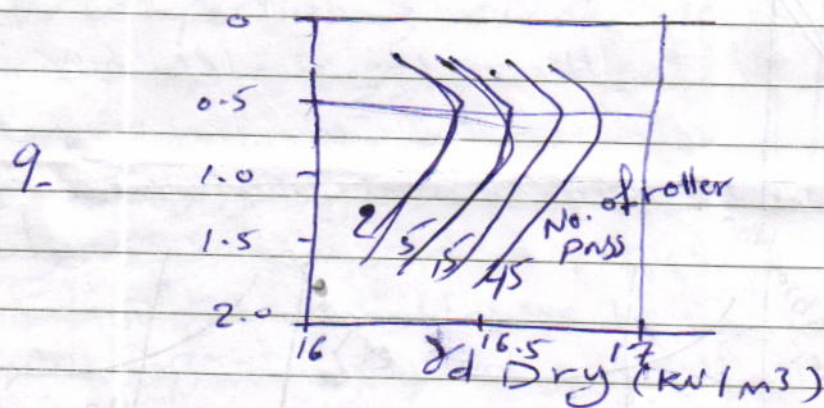
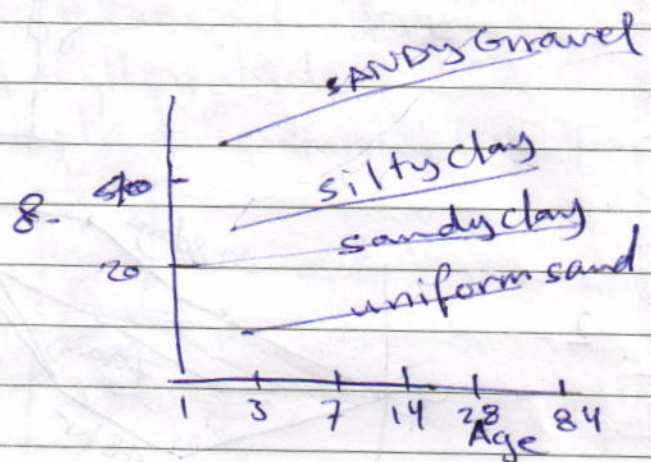
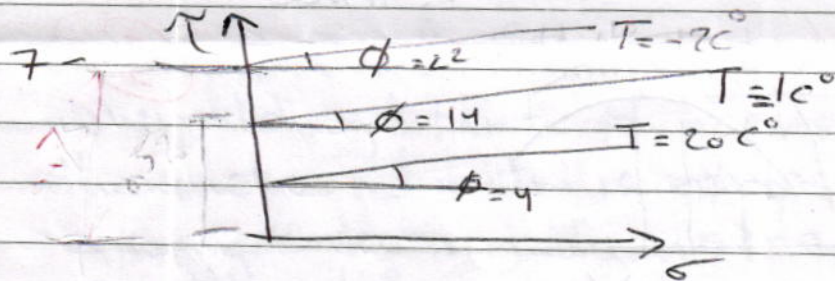
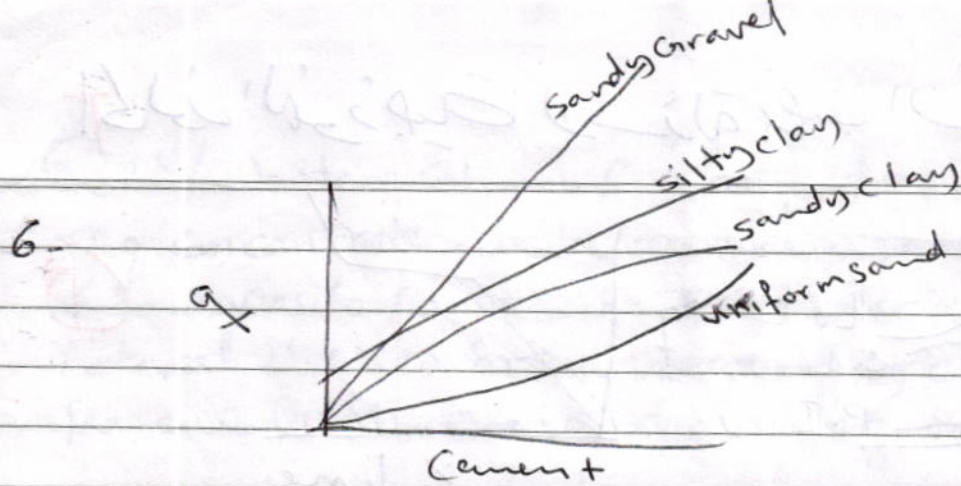
*Good Luck*



# الكاليفورنية لاسئلة نصف السنة / امتحان في مادة







Q1-B-

$$C.E = \frac{\text{wt. of hammer} \times \text{height of ball} \times \text{No. of Layer} \times \text{No. of blows/layer}}{\text{mold vol.}}$$

for standard

$$C.E = \frac{2.5 \text{ kg} \times 0.3 \text{ m} \times 3 \times 25 \text{ b/layer}}{0.944 \times 10^{-3} \text{ m}^3} = 592.7 \text{ KJ/m}^3$$

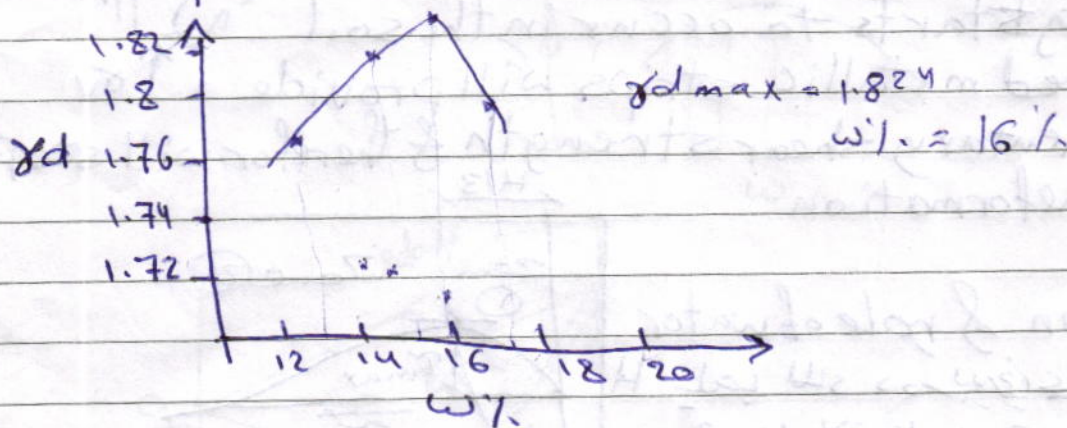
For Modified.

$$C.E = \frac{4.5 \text{ kg} \times 0.45 \text{ m} \times 5 \times 25}{0.944 \times 10^{-3}} = 2693.3 \text{ KJ/m}^3$$

$$\frac{M}{C} = 4.54$$



Q2A/w%	$\frac{M}{V} = \rho_{wet}$	$\rho_d = \frac{\rho_{wet}}{1+w}$
13	2.012	$2.012 / 1 + 0.13 = 1.781$
15	2.095	$2.095 / 1 + 0.15 = 1.822$
16	2.116	$2.116 / 1 + 0.16 = 1.824$
17	2.1	$= 1.79$
14	2.056	$= 1.80$



To plot 10% air cont.

$$\gamma_d = \frac{G_s \gamma_w (1 - U_a)}{1 + w G_s} =$$

$$w\% \quad 15 \quad 16 \quad 17$$

$$\gamma_d = \frac{2.67 \times 1 \times (1 - 0.1)}{1 + 2.67(w\%)} = \frac{2.403}{1.4005} = 1.716 \quad w\% \quad 15$$

$$\frac{2.403}{1.4272} = 1.684 \quad 16$$

$$\frac{2.403}{1.4539} = 1.653 \quad 17$$

$$\gamma_{d \max} = \frac{2.67 \times 1 \times (1 - U_a)}{1 + 2.67 \times 0.16}$$

1.824

$U_a =$



