DIPLOMA IN CIVIL ENGINEERING

Term-End Examination

June, 2012

01990

BCE-046 : SOIL MECHANICS AND FOUNDATION ENGINEERING

Time : 2 hours   *Maximum Marks : 70*

Note : *Question number 1 is **compulsory**. Attempt any **four** more questions from the remaining questions. All questions carry **equal** marks.*

1. Choose the correct alternative :   7x2=14

   (a) Coefficient of curvature can be expressed as :

   (i) D_{60}/D_{10}

   (ii) $D_{60}^2 / D_{30} \times D_{10}$

   (iii) $D_{30}^2 / D_{60} \times D_{10}$

   (iv) $D_{30}/D_{60} \times D_{10}$

   (b) Effective stress is :

   (i)   the stress at particles contact

   (ii)   a physical parameter that can be measured

   (iii)   important because it is function of engineering properties of soil

   (iv)   All of the above

(c) Shear strength of soil is a unique function of :

(i) effective stress only

(ii) total stress only

(iii) both effective stress and total stress

(iv) None of the above

(d) In case of perfectly saturated soil, the voids are filled completely with :

(i) water

(ii) air

(iii) soil solids

(iv) mixture of air and water

(e) The maximum dry density up to which any soil can be compacted depends upon :

(i) moisture content only

(ii) amount of compaction energy only

(iii) both moisture content and amount of compaction energy

(iv) none of the above

(f) The natural water content of a soil mass lies between its liquid limit and plastic limit, the soil mass is said to be in :

(i) liquid state

(ii) plastic state

(iii) semi-solid state

(iv) solid state

(g) The angle that Coulomb's failure envelop makes with the horizontal is called :

(i) cohesion

(ii) angle of repose

(iii) angle of internal friction

(iv) none of the above

2. (a) Using phase relationships, show that : **7**

$WG = Se$

Where all the terms have their usual meanings.

(b) The void ratio (e) of a soil mass is 0.7 and its **7** specific gravity (6) is 2.72. Find the moisture content and bulk unit weight, if the degree of saturation is 80%.

3. (a) What do you mean by compaction ? **7** Explain its significance.

(b) The following are the results of standard **7** compaction test performed on a sample of clayey soil :

Moisture content (%)	12.0	13.8	17.0	19.20	20.5
Dry unit weight (kN/m^3)	15.76	16.92	18.01	17.65	16.6

Plot the water content - dry density curve and obtain the optimum water content and maximum dry density.

4. (a) Describe the advantages of variable head **7**
permeability test over constant head
permeability test.

(b) A stratified soil deposit consists of four **7**
layers of equal thickness. The coefficient of
permeability of the second, third and fourth
layers are respectively 1/3rd, 1/2 and twice
of the coefficient of permeability of the top
layer.

Compute the average permeabilities of the
deposit parallel and perpendicular to the
direction of stratification in terms of the
permeability of the top layer.

5. (a) Explain the advantages and limitations of **7**
unconfined compression test.

(b) In an unconfined compression test on a soft **7**
clay, the following data was observed :

Length of sample, $L_o = 150$ mm

Initial area of sample, $A_o = 1500$ mm^2

Extension of spring at failure, $\Delta L = 30$ mm

Spring constant $= 15$ N/mm

Compression of the sample at
failure $= 20$ mm

Determine the unconfined compressive
strength of the soil specimen using corrected
area.

6. (a) Discuss the various factors on which depth 7
of exploration depends.

(b) Explain the principal modes of bearing 7
capacity failures.

7. (a) Discuss the various factors on which choice 7
of foundation depends for a given situation.

(b) A wooden pile is being driven with a drop 7
hammer weighing 20 kN and having a free
fall of 1.0m. The penetration in the last blow
is 5 mm. Determine the load carrying
capacity of the pile according to the
Engineering news formula:

8. Write short notes on *any four* of the following :

$4 \times 3\frac{1}{2} = 14$

(a) Plasticity Index

(b) Consolidation

(c) Effective stress

(d) Combined Foundation

(e) Factors affecting permeability