DIPLOMA IN CIVIL ENGINEERING

Term-End Examination

December, 2011

01042

BCE-046 : SOIL MECHANICS AND FOUNDATION ENGINEERING

Time : 2 hours   *Maximum Marks : 70*

Note : Question no.1 is compulsory. Attempt any four questions out of question numbers 2 to 8. All questions carry equal marks.

1.   Choose the corrective alternative :   **7x2=14**

(a)   A soil has bulk density of 11 kN/m³ and water content 10%. The dry density of soil is :

(i)   9 kN/m³   (ii)   10 kN/m³

(iii) 11 kN/m³   (iv)   12 kN/m³

(b)   The process in which air is expelled out of the voids by the application of pressure, and the soil particles are forced to move closer to give a denser packing is known as :

(i)   Consolidation

(ii)   Compression

(iii) Soil Compaction

(iv) Soil stabilisation

(c) The water content of soil which respressents the boundary between plastic state and liquid state is known as :

(i)   liquid limit

(ii) plastic limit

(iii) shrinkage limit

(iv) plasticity index

(d) In an unconfined compression test on a clay specimen of initial volume V and length L, the area of cross section at failure is taken as :

(i) $\dfrac{V + \Delta V}{L - \Delta L}$ (ii) $\dfrac{V - \Delta V}{L - \Delta L}$

(iii) $\dfrac{V}{L + \Delta L}$ (iv) $\dfrac{V}{L - \Delta L}$

(e) Uniformity coefficient can be expressed as :

(i)   D60/D10 (ii) D60

(iii) D10 (iv) D10/D60

(f) Effective stress in a soil is equal to

(i)   total stress

(ii) total stress-pore water pressure

(iii) pore water pressure

(iv) none of the above

(g) Unconfined compression strength test is :

(i)   drained test

(ii) consolidated drained test

(iii) undrained test

(iv) consolidated undrained test

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

$$V_{bulk} = \frac{GVw\,(1 + w)}{(1 + e)}$$

where all the terms have their usual meanings.

(b) The dry unit weight of a soil having 15% 7 moisture content is $17.5\ kN/m^3$. Find the bulk unit weight. Saturated unit weight and submerged unit weight.

Assume $G = 2.70$

3. (a) Describe the effects of moisture on 7 compaction.

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

Water content (%)	5	10	14	20	25
Bulk density (kN/m³)	17.7	19.8	21	21.8	21.6

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

4. (a) What do you mean by permeability ? **7**
Discuss the importance of study of
permeability.

(b) Determine the neutral and effective stresses **7**
at a depth of 15m below the ground surface
for the following conditions.

Water table is 3m below the ground surface.
For the soil, $G = 2.65$, $e = 0.7$, average
moisture content of the soil above the water
table = 5%. Also assume $Vw = 10kN/m^3$.

5. (a) Explain the stress conditions in soil **7**
specimen during triaxial testing.

(b) A cylinder of soil fails under an axial vertical **7**
stress of $160 \ kN/m^2$ when it is laterally
unconfined. The failure plane makes an
angle of 50° with the horizontal. Calculate
the value of cohesion and angle of internal
friction of the soil.

6. (a) Explain the various purposes for which soil **7**
exploration is carried out.

(b) Discuss the various factors affecting the **7**
bearing capacity of soil.

7. (a) Explain the various purposes for which 7 foundation is provided.

(b) In a 16 pile group the pile diameter is 45cm 7 and centre to centre spacing of the square group is 1.5m. If C = 50 kN/m², determine whether the failure would occur with the pile acting individually, or as a group ? Neglect bearing at the tip of the pile. All piles are 10m long. Take m = 0.7 for shear mobilisation around each pile.

8. Write short notes on *any four* of the following : 4x3 $\frac{1}{2}$ =14

(a) Gradation

(b) Compaction

(c) Darcy's Law

(d) Consistency Limits

(e) Mohr Coulomb theory of shear strength.

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