DIPLOMA IN CIVIL ENGINEERING
DCLE(G)
Term-End Examination

00990

June, 2014

BCE-046 : SOIL MECHANICS AND FOUNDATION ENGINEERING

Time : 2 hours   *Maximum Marks : 70*

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

1.   Choose the correct alternative :   *7×2=14*

   (a)   The soils which are deposited at the bottom of lakes are known as

      (i)   alluvial soils

      (ii)   aeolian soils

      (iii) lacustrine soils

      (iv)   marine soils

   (b)   The corrections normally applied to hydrometer readings are

      (i)   meniscus correction

      (ii)   temperature correction

      (iii) dispersing agent correction

      (iv)   All of the above

(c) The effective stress is equal to

(i) total stress minus neutral stress

(ii) total stress

(iii) neutral stress

(iv) total stress plus neutral stress

(d) The shear test under all the three drainage conditions can be performed with complete control in

(i) direct shear test

(ii) triaxial test

(iii) unconfined compression test

(iv) vane shear test

(e) Area Ratio (A_r) can be expressed as

(i) $\dfrac{D_2^4 - D_1^4}{D_1}$

(ii) $\dfrac{D_2^3 - D_1^3}{D_1}$

(iii) $\dfrac{D_2^2 - D_1^2}{D_1}$

(iv) $\dfrac{D_2 - D_1}{D_1}$

(f) The principal modes of failure of shallow foundation are

(i) General shear failure

(ii) Local shear failure

(iii) Punching shear failure

(iv) All of the above

(g) Which of the following is *not* a deep foundation ?

(i) Grillage foundation

(ii) Pile foundation

(iii) Pier foundation

(iv) Well foundation

2. (a) Using phase relationships, show that

$$\gamma_{sat} = \left(\frac{G+e}{1+e}\right)\gamma_w$$ 7

(b) A sand sample has a porosity of 35% and specific gravity of 2·70. Calculate its

(i) Voids ratio

(ii) Dry unit weight

(iii) Submerged unit weight

Assume $\gamma_w = 10 \text{ kN/m}^3$. 7

3. (a) Explain the procedure of determination of Shrinkage Limit in the laboratory. 7

(b) The grading curve of a soil gives the following values :

$D_{10} = 0\cdot20$ mm, $D_{30} = 0\cdot50$ mm, and $D_{60} = 0\cdot75$ mm

Determine the uniformity coefficient (C_u) and coefficient of curvature (C_c). 7

4. (a) Describe Darcy's Law. Also discuss validity of Darcy's Law. 7

(b) A sand deposit is made up of three horizontal layers of equal thickness. The permeability of top, middle and bottom layers is 3×10^{-5} mm/sec, 4×10^{-5} mm/sec and 5×10^{-5} mm/sec respectively. Find the equivalent permeability in the horizontal and vertical directions. 7

5. (a) Describe the advantages and limitations of Triaxial Shear Test. 7

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

Length of sample, $L_0 = 125$ mm

Initial area of sample, $A_0 = 1250$ mm^2

Extension of spring at failure, $\Delta_L = 25$ mm

Spring constant = 12 N/mm

Compression of the sample at failure = 25 mm

Determine the unconfined compressive strength of the soil specimen using corrected area. 7

6. (a) Describe the effect of moisture content on compaction. 7

(b) Explain the various purposes for which soil exploration is carried out. 7

7. (a) Describe the principal modes of failure of shallow foundations. 7

(b) Compute the ultimate bearing capacity of a strip footing of width 2·0 m and 1·50 m below the surface of a moist soil having cohesion of 20 kN/m^2. Assume general shear failure. Use Terzaghi's analysis.

Take $\gamma = 20$ kN/m^3

$N_c = 52·6$, $N_q = 36·5$, and $N_\gamma = 35·0$. 7

8. (a) What do you mean by a well foundation ? Discuss its use. 7

(b) A precast concrete pile is being driven with 60 kN hammer having a free fall of 1·5 m. If the penetration in the last blow is 10 mm, determine the allowable load carrying capacity of the pile according to Engineering News Formula.

Take C = 25 mm and F = 6. 7

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