

**DIPLOMA IN CIVIL ENGINEERING  
DCLE(G)**

**Term-End Examination**

**June, 2016**

00246

**BCE-046 : SOIL MECHANICS AND FOUNDATION  
ENGINEERING**

*Time : 2 hours*

*Maximum Marks : 70*

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**Note :** *Question no. 1 is compulsory. Attempt four more questions from the remaining questions. All questions carry equal marks.*

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

(a) Uniformity coefficient can be expressed as

(i)  $D_{30}/D_{10}$

(ii)  $D_{60}/D_{10}$

(iii)  $D_{30}/D_{60}$

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

- (b) The void ratio of a saturated soil with water content 15% and specific gravity 2.6 is
- (i) 0.15
  - (ii) 0.26
  - (iii) 0.39
  - (iv) 0.45
- (c) The unconfined compressive strength of a cohesive soil is  $\sigma$ . The cohesion of this soil will be
- (i)  $\frac{\sigma}{2}$
  - (ii)  $\sigma$
  - (iii)  $2\sigma$
  - (iv)  $3\sigma$
- (d) The total stress on the soil is  $25 \text{ kN/m}^2$ , and pore pressure is  $10 \text{ kN/m}^2$ , then effective stress will be (in  $\text{kN/m}^2$ )
- (i) 25
  - (ii) 10
  - (iii) 15
  - (iv) 35
- (e) On increasing the temperature, the permeability of soil
- (i) increases
  - (ii) decreases slowly
  - (iii) decreases suddenly
  - (iv) does not change

- (f) Zero air void line is
- (i) 100% saturation line
  - (ii) 90% saturation line
  - (iii) 10% saturation line
  - (iv) Zero percent saturation line
- (g) If the liquid limit, plastic limit and shrinkage limit of the soil are 30%, 20% and 10% respectively, then plasticity index will be
- (i) 10%
  - (ii) 20%
  - (iii) 30%
  - (iv) 40%

2. (a) Using phase relationship, prove that

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

- (b) The water content of a saturated soil is 40% and specific gravity of soil solid is 2.65. Find the void ratio and porosity. Also find the degree of saturation, if the water content gets reduced to 10% on drying. 7

3. (a) Define compression index, coefficient of volume change and coefficient of consolidation. 7

- (b) Discuss the factors affecting compaction. 7

4. (a) A sand deposit is made up of three horizontal layers of equal thickness. The permeability of the top, middle and bottom layers in cm/sec are  $2.1 \times 10^{-6}$ ,  $3.2 \times 10^{-6}$  and  $3.7 \times 10^{-6}$  cm/sec, respectively. Find the equivalent permeability in horizontal and vertical directions. 7
- (b) Derive the relation used for finding permeability by falling head method. 7
5. (a) Explain the methods of exploration by borings. 7
- (b) The following results are obtained from a series of drained direct shear tests on silty clay. Find  $c$  &  $\phi$ . 7

S.No.	Normal stress (kPa)	Max. shear stress (kPa)
1	10	10
2	20	14.5
3	30	20

6. (a) Explain General shear failure, Local shear failure and Punching shear failure. 7
- (b) Find the ultimate and safe bearing capacity of a strip footing of 2.0 m width resting on the surface of a saturated clay. Take  $c = 65 \text{ kN/m}^2$  and factor of safety as 3. 7

7. (a) Why are under-reamed piles provided ?  
Explain with a neat sketch. 7
- (b) A circular pile of diameter 600 mm and 11 m long, penetrates a deposit of clay with  $c = 40 \text{ kN/m}^2$ . Take  $m = 0.65$ . Find the skin friction. 7
8. Write short notes on any *two* of the following :  $2 \times 7 = 14$
- (a) Direct shear test
- (b) Types of foundations
- (c) Determination of liquid limit by Casagrande method
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