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**BICE-024**

# DIPLOMA IN CIVIL ENGINEERING (DCLEVI) / ADVANCED LEVEL CERTIFICATE IN CIVIL ENGINEERING (ACCLEVI)

00376

## Term-End Examination

## June, 2016

## BICE-024 : SOIL MECHANICS AND FOUNDATION ENGINEERING

*Time : 2 hours* *Maximum Marks : 70*

***Note :*** *Attempt any **five** questions. Question no. **1** is **compulsory**. All questions carry equal marks. Use of scientific calculators is allowed.*

**1.** Choose the correct option from the following : *7×2=14*

(a) Water content of soil can

(i) never be greater than 100%

(ii) take values only from 0% to 100%

(iii) be less than 0%

(iv) be greater than 100%

(b) Valid range for n, the % voids, is

(i) $0 < n < 100$

(ii) $0 \leq n \leq 100$

(iii) $n > 0$

(iv) $n \leq 0$

(c) When the plastic limit of a soil is greater than the liquid limit, then the plasticity index is reported as

(i) negative

(ii) zero

(iii) non-plastic (NP)

(iv) 1

(d) Coarse grained soils are best compacted by a

(i) drum roller

(ii) rubber tyred roller

(iii) sheep's foot roller

(iv) vibratory roller

(e) If the shearing stress is zero on two planes, then the angle between the two planes is

(i) 45°

(ii) 90°

(iii) 135°

(iv) 225°

(f) Terzaghi's bearing capacity factors $N_c$, $N_q$ and $N_\gamma$ are functions of

(i) cohesion only

(ii) angle of internal friction only

(iii) both cohesion and angle of internal friction

(iv) None of the above

(g) Which of the following pairs is/are correctly matched ?

(A) Standard penetration test – Relative density

(B) Vane shear – Cohesion

(C) Consolidation test – Bearing capacity

(i) A, B and C

(ii) A alone

(iii) A and B

(iv) B and C

**2.** (a) Find the relation between e, G, w and $S_r$ for a soil sample. Here, e = Void ratio, G = Specific gravity, w = Water content $S_r$ = Saturation ratio. 7

(b) Describe the Pycnometer method to determine water content for coarse gained soils with known specific gravity G. 7

3. Calculate the coefficient of permeability of a soil sample, 6 cm in height and 50 $cm^2$ in cross-sectional area, if a quantity of water equal to 430 ml is passed down in 10 minutes, under an effective constant head of 40 cm. On over-drying, the test specimen has a mass of 498 g. Taking the specific gravity of soil solids as 2·65, calculate the seepage velocity of water during the test. *14*

4. (a) Discuss the Mohr-Coulomb Failure theory in detail. *7*

   (b) A cylinder of soil fails under an axial vertical 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 the angle of internal friction of the soil. *7*

5. (a) Explain the Proctor Needle method to determine water content. *7*

   (b) Write the factors which affect the compacted density of soil. *7*

6. (a) Write the assumptions in Terzaghi's analysis for bearing capacity of soil. 5

(b) Design a strip footing to carry a load of 750 kN/m at a depth of 1·6 m in a $c - \phi$ soil having a unit weight of 18 kN/m$^3$ and shear strength parameters as c = 20 kN/m$^3$ and $\phi = 25°$. Determine the width of footing, using a factor of safety of 3 against shear failure. Use Terzaghi's equations.

For $\phi = 25°$, $N_c = 25{\cdot}1$, $N_q = 12{\cdot}7$ and $N_\gamma = 9{\cdot}7$. 9

7. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Augur Boring

(b) Standard Penetration Test

(c) Negative Skin Friction

(d) Under-Reamed Pile Foundations

(e) Spread Footing

(f) Disturbed and Undisturbed Samples