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BICE-024

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

00993 **Term-End Examination**

December, 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 calculator is allowed.*

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

(a) Valid range for S, the degree of saturation of soil in percentage is

(i) $S > 0$

(ii) $S \leq 0$

(iii) $0 < S < 100$

(iv) $0 \leq S \leq 100$

(b) Uniformity coefficient of a soil is

(i) always less than 1

(ii) always equal to 1

(iii) equal to or less than 1

(iv) equal to or greater than 1

(c) Time factor for a clay layer is

(i) a dimensional parameter

(ii) directly proportional to permeability of soil

(iii) inversely proportional to drainage path

(iv) independent of thickness of the clay layer

(d) If a cohesive soil specimen is subjected to a vertical compressive load, the inclination of the cracks to the horizontal is

(i) 90°

(ii) 45°

(iii) 22·5°

(iv) 0°

(e) For a base failure, the depth factor D_f is

(i) zero

(ii) 1

(iii) $0 < D_f < 1$

(iv) $D_f > 1$

(f) A soil having particles of nearly the same size is known as

(i) well graded

(ii) uniformly graded

(iii) poorly graded

(iv) gap graded

(g) The minimum centre to centre spacing of friction piles of diameter (D) as per BIS code is

(i) 1·5 D

(ii) 2 D

(iii) 2·5 D

(iv) 3 D

2. (a) Explain the following terms for soils : *4×2=8*

(i) Coarse grained soil

(ii) Density Index

(iii) Liquidity Index

(iv) Well graded soil

(b) The mass specific gravity of a soil equals 1·64. The specific gravity of solids is 2·70. Determine the void ratio under the assumption that the soil is perfectly dry. *6*

3. (a) Explain the Darcy's Law of flow of water through soil with suitable sketch. 7

(b) Explain the Constant Head Permeability Test with suitable required sketch. 7

4. (a) Discuss the advantages and disadvantages of direct shear test. 7

(b) A vane, 10 cm long and 8 cm in diameter, was pressed into soft clay at the bottom of a bore hole. Torque was applied and gradually increased to 45 N-m when failure took place. Calculate the cohesion of the clay in the natural state. 7

5. Explain the following field compaction methods in detail : *6+4+4=14*

(a) Rollers

(b) Rammers

(c) Vibrators

6. A square footing located at a depth of 1·3 m below the ground has to carry a safe load of 800 kN. Find the size of the footing, if the desired factor of safety is 3. The soil has the following properties :

Void ratio = 0·55; Degree of saturation = 50%, Specific gravity = 2·67, c = 8 kN/m^3, ϕ = 30° Use Terzaghi's analysis.

For $\phi = 30°$, $N_c = 37·2$, $N_q = 22·5$ and $N_\gamma = 19·7$. *14*

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

(a) Split Spoon Sampler

(b) Wash Boring

(c) Geophysical Methods

(d) Efficiency of Pile Group

(e) Shallow Foundations and Well Foundations

(f) Pressure distribution beneath a rigid footing