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Total No. of Questions : 09

B.Tech.(CE) (2011 Onwards) (Sem.–5)

GEOTECHNICAL ENGINEERING

Subject Code : BTCE-502

M.Code : 70513

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

a) Given : e(void ratio) = 0.86, w = 28%, G = 2.72

Calculate γ_{bulk}, and γ_{Sat}.

b) If at e = 0.4, k (co-efficient of permeability) = 0.001 cm/sec

Then, at e = 0.6, k = ?

c) Given : H = 2 m, C_v = 0.0002 sq. cm/ sec (double drainage)

How long it will take to attain half of the total settlement?

d) If G = 2.68, w = 17%

Calculate theoretical maximum dry density.

e) A soil sample consists of Gravel *30%, sand 40%, silt + clay 30%*

LL =33%, PI = 12%

Write down soil classification as per 1498-1970.

f) Define critical hydraulic gradient.

g) Give the statement of Darcy's law.

h) Write down particle size ranges of sand, silt and clays.

i) Define '*Co-efficient of volume change*'.

j) Define over-consolidation ratio.

SECTION-B

2. A new canal is excavated to a depth of 5 m below ground level in a soil having the following characteristics : c = 14 kN /m^2; ϕ =15°, e = 0.8 and G = 2.7. The slope of bank is 1 in 1. Calculate the FOS with respect to cohesion when the canal runs full. If it suddenly and completely emptied, what will be FOS then? (Stability No S_n for ϕ = 7.3 and 15 degree may be taken as 0.112 and 0.083)

3. The following data are given for a soil sample. Porosity = 0.45,

   Sp. Gr of soil solids = 2.68, Moisture content = 10%

   Determine the mass of water to be added to 10 m^3 of soil for full saturation.

4. The time required for 50% consolidation of 25 mm thick clay layer (double drainage) in the laboratory is 2 min 20 sec. How long (in days) will it take for a 3 m thick clay layer of the same clay in the field under the same pressure increment to reach 50% consolidation? In the field, there is a rock layer at the bottom of the clay.

5. How do you determine Co-efficient of permeability in laboratory on a clay sample? Explain and derive the expression for it.

6. Write short notes on the following :

   a) Isochrones.

   b) Field Compaction control method.

SECTION-C

7. a) Enumerate the assumptions in Terzaghi's theory of one-dimensional consolidation (2)

   b) Derive the Terzaghi differential equation for one-dimensional primary consolidation. (8)

8. a) Enumerate the advantages of tri-axial shear strength tests. (2)

b) Draw a typical stress-strain and volume change curve for loose and dense sand. (4)

c) Following are the results of two drained tri-axial tests on the same clay samples.

Sample I: $\sigma_3 = 70kN/m^2$, $\sigma_d = 173kN/m^2$

Sample II: $\sigma_3 = 105\ kN/\ m^2$, $\sigma_d = 235\ kN/m^2$

Determine shear strength parameters.

(σ_3 = Cell Pressure, σ_d = Deviatoric stress) (4)

9. Differentiate between followings :

a) Standard and modified Proctor tests for compaction.

b) Compaction and Consolidation.

c) Finite slope and Infinite slope.

d) Discharge velocity and Seepage Velocity.

e) Consolidated drained and Consolidated undrained test. (5 × 2)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.