

TCE-506

1203

Odd Semester Examination, 2017-18

B.TECH. (SEMESTER-V)

SOIL MECHANICS AND ENGINEERING GEOLOGY

Time: 03:00 Hours

Max Marks: 100

Note: All question carry equal marks. All questions are compulsory. All parts of the question carry equal marks. Assume any missing data, but mention it on answer book clearly.

1. Attempt any four: [5x4= 20]
- (a) Discuss properties of following soil types: Bentonite, Kaoline, Clay, Shale.
 - (b) Define dip and strike. What is the importance of topographic maps and geological maps for civil engineers?
 - (c) Classify the soil under the unified soil classification system
 - (d) Write engineering properties of rocks. Explain about the igneous rock formation.
 - (e) Write short notes on the following:
 - i. Coefficient of consolidation
 - ii. Quicksand condition
 - iii. Compression index
 - iv. Compaction
 - (f) Write the Mohr-Coulomb failure criterion for soils and explain the terms involved.
2. Attempt any four: [5x4=20]
- (a) Write short notes
 - i. Index properties of soil
 - ii. Engineering Properties of soil
 - iii. Phase Diagram

- (b) A partially saturated sample from a borrow pit has a natural moisture content of 15% and bulk unit weight of 1.9g/cc. The specific gravity of solid is 2.70. Determine the degree of saturation, void ratio and unit weight of saturated sample.
- (c) Explain triaxial test. Also, list its merits and demerits.
- (d) A soil sample is found to have the following properties. classify the soil according to IS classification system. Passing 75 μ sieve =10%, passing 4.75 mm sieve = 70%, uniformity coefficient = 8, coefficient of curvature = 2.8, plasticity index = 4%.
- (e) State the Boussinesq formula for Vertical stress distribution in soil under a point load
- (f) State Darcy's law of permeability of soil.

3. Attempt **any two** out of three questions: [10x2=20]

- (a) A clay layer 3m thick is having water content 45%, and specific gravity of solids 2.7. This clay layer is lying below another layer which is 5m thick sand layer. The sand layer at the top is having void ratio 0.6 and with degree of saturation 40% and $G_s = 2.65$. The water table is at depth of 3m below. Determine the total stress, pore pressure and effective stress at various levels and draw the corresponding diagrams.
- (b) Define the unconfined pumping out flow and determine the coefficient of permeability of soil. Also explain Draw Down Curve.
- (c) In laboratory triaxial test, following results were obtained :

Normal stress (kg/cm ²)	1	1.5	2.0
Shear dial gauge reading	54	66	76
Deformation dial gauge reading	850	1400	1550

The least count of proving ring for shear stress measurement is 4 Div = 1kg, the size sample of is 6cm x 6 cm. The least count of deformation dial gauge reading is 0.001 cms. Compute angle internal friction (ϕ), and cohesive strength (c).

4. Attempt **any two** out of three questions: [20]

- (a) Explain various compaction techniques with neat sketches.
- (b) Discuss the piping phenomenon and explain how it is detrimental to the safety of any hydraulic structure.

(c) Explain following

- i. Method to determine value of coefficient of compression index.
- ii. Pycnometer test for determining specific gravity

5. Attempt **any two** out of three questions:

[20]

- (a) A clay layer of 8m thick with single drainage settles by 120mm in 2 years. the coefficient of consolidation for this was found to be $6 \times 10^{-3} \text{ cm}^2/\text{s}$. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90% of this ultimate settlement.
- (b) Direct shear test was conducted on compressed sand shear box of dimensions 60mmx60mm. the readings are listed below :

Normal load (N)	Shear load	
	Peak	Ultimate
110	95	65
225	195	135
340	294	200

Determine the angle of shearing resistance (a) in dense compacted state (b) in loose state.

- (c) Describe nay four techniques for slope protection with clear sketches.
