Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80202

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Civil Engineering

CE 6405 — SOIL MECHANICS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the phase diagram for Dry Soil and Saturated Soil.

2. List any four equipment / methods for Field Compaction of Soil.

3. Differentiate discharge velocity and seepage velocity.

4. State the Darcy's law of Permeability of soil.

5. State the Boussinesq formula for Vertical Stress Distribution in Soil under a Point Load.

6. State Drainage Path lengths for Single and Double Drainage conditions for a soil layer(Height H).

7. Draw the Mohr's Circle diagram for UCC test and mention the salient features.

8. Define Liquefaction and the effects on Structural Stability due to liquefaction

9. Compare Finite Slopes and Infinite Slopes.

10. Draw a Slip Circle for a failure plane in a slope and show the forces involved.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the relationship between Porosity (n) and Void Ratio (e). (8)

(ii) A partially saturated sample from a borrow pit has a natural moisture content of 15% and bulk unit weight of 1.9 g / cc. The specific gravity of solids is 2.70. Determine the degree of Saturation and void ratio. What will be the unit weight of the soil if it gets saturated? (8)

Or

(b) (i) Describe the proctor Compaction Test in detail. (8)

(ii) Draw the diagram for the three Atterberg Limits of a soil and mark the various soil phases. (4)

(iii) Define Sensitivity and Thixotropy for a soil. (4)

12. (a) (i) A clay layer 3 m 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 lying at the top is having void ratio 0.6 and with Degree of saturation 40% and Gs = 2.65. The water table is at a depth of 3m below. Determine the Total Stress, Pore Pressure and Effective Stress at various levels and draw the corresponding diagrams. (12)

(ii) Define Quicksand condition and Critical Hydraulic Gradient. (4)

Or

(b) (i) List the various types of Soil water. (4)

(ii) Describe the Unconfined Pumping Out Flow and determine the coefficient of permeability of soil. Also explain Draw Down Curve. (12)

13. (a) (i) Describe the Newmark's chart and its application. (8)

(ii) A concentrated load of 22.5 kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 3m, 6m, 9m, 12m and 15m directly below the point load; draw the vertical stress distribution diagram along vertical axis. (8)

Or

(b) (i) Describe Terzaghi's Theory of One Dimensional Consolidation along with the Spring Analogy. (8)

(ii) A clay layer of 8m thick with Single Drainage settles by 120mm in 2 years. The coefficient of consolidation for this clay was found was found to be $6 * 10^{-3} cm^2 / s$. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90% of this ultimate settlement. (8)

14. (a) (i) Describe the Vane Shear Test in detail and explain the two methods adopted in this test – Fully submerged Vane and Partially Submerged Vane. (8)

(ii) An unconfined Compression Test was conducted on an undisturbed clay sample. The sample had a diameter of 37.5mm and length 80mm. Load at failure measured by proving ring was 28 N and the axial deformation at failure point was 13mm. Determine the unconfined compressive strength and the undrained shear strength of the clay. Plot all the results on a Mohr's Circle. (8)

Or

(b) (i) Direct Shear Test was conducted on Compacted Sand Shear Box Dimensions 60 mm * 60 mm . The readings are listed below.

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

Determine the Angle of Shearing resistance

(1) in the dense compacted state

(2) in the loose state. (12)

(ii) Define Deviator stress and its significance in Triaxial Shear Strength Test. (4)

15. (a) Describe the Fellinius Circle Method of analyzing the stability of slopes. (16)

Or

(b) (i) Brief total stress method of analysis of stability of slopes. (8)

(ii) Describe any four techniques for slope Protection with clear sketches. (8)