

B.Tech III Year II Semester (R13) Regular & Supplementary Examinations May/June 2017

GEOTECHNICAL ENGINEERING – I

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

PART - A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Differentiate between single grained structure and honey-comb structure.
 - Differentiate between percentage air voids and air content.
 - What are the main index properties of a coarse grained soil?
 - Differentiate between activity and sensitivity.
 - What is the effect of surcharge on the effective stress?
 - Differentiate between compaction and consolidation.
 - What is field consolidation curve?
 - Differentiate between failure envelope and modified failure envelope.
 - Define principal planes.
 - What is critical void ratio?

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

- 2 Derive a relationship between dry density, specific gravity of soil particles, void ratio and density of water of a soil sample using three phase diagram.

OR

- 3 (a) Explain the test procedure to determine shrinkage limit of a soil.
 (b) The consistency limits of a soil are LL = 52%, PL = 32% and SL = 17%. If the soil shrinks from a volume of 10 cm³ at LL to 6.01 cm³ at shrinkage limit, calculate the specific gravity of solids.

UNIT - II

- 4 (a) What are the characteristics of flow nets? Explain in detail the methods of constructing the same.
 (b) In a falling head permeameter, if the time intervals for drop in levels from H₁ to H₂ and H₂ to H₃ are equal, prove that $H_2 = \sqrt{(H_1 * H_3)}$.

OR

- 5 (a) What is quick sand condition? List out the conditions that are favorable for quick sand condition.
 (b) What are the different parameters of the soils that influence the permeability of soils?

UNIT - III

- 6 How do you construct a Newmark's influence chart? Mention its applications.

OR

- 7 (a) Give the salient features of compaction curve and explain the significance of zero air void line.
 (b) Derive an expression for vertical stress at a point due to vertical load. Use Boussinesq's theory.

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UNIT - IV

- 8 (a) Explain Terzaghi's theory of consolidation. Discuss the assumption and their validity.
 (b) A 3 m thick clay layer beneath a structure is overlain by a permeable stratum and is underlain by an impervious stratum. The coefficient of consolidation of the clay was found to be $0.028 \text{ cm}^2/\text{minutes}$. The final expected settlement of the layer is 80 mm. Determine the time taken for 75% of full consolidation and the time required for 2.5 cm settlement.

OR

- 9 (a) What is coefficient of consolidation? How it is determined in the laboratory?
 (b) A clay layer 4.0 m thick is subjected to a pressure of 55 kPa. If the layer has double drainage and undergoes 50% consolidation in one year, determine the coefficient of consolidation. Take $T_v = 0.196$.

UNIT - V

- 10 What are the merits of tri axial shear test over box shear test? Explain the different conditions for which soils under tri axial tests can be conducted.

OR

- 11 The following are the results of box shear test on a soil.

Normal Stress(kPa)	25	75	150	250
Shear stress at failure(kPa)	55	75	100	140

Determine cohesion and angle of internal friction of the soil. Also determine the deviator stress required for the failure of the same soil specimen under triaxial test with a cell pressure of 100 kPa.
