

Code: 15A01503

B.Tech III Year I Semester (R15) Supplementary Examinations June 2018

GEOTECHNICAL ENGINEERING – I

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
 (Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Draw the three phase diagram for soil system and two phase diagram for saturated soil.
 - Explain the significance of a grain size distribution curve.
 - Write the expression of permeability in stratified soils when the flow is parallel and perpendicular to stratification.
 - What are the uses of flow nets?
 - Give the limitations of Boussinesq theory of stresses.
 - Calculate compaction energy used in standard proctor test and modified proctor test.
 - What is over consolidation ratio? Explain briefly with an example.
 - Differentiate between primary consolidation and secondary consolidation.
 - Explain the Mohr-Coulomb theory for shear strength of soils.
 - Classify the shear tests based on drainage conditions.

PART – B

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

UNIT – I

- 2 (a) List the common clay minerals in soil and explain any one in detail.
 (b) The bulk unit weight of soil is 21 kN/m^3 . The water content is 15% and specific gravity of solids is 2.7. Determine dry unit weight, void ratio, porosity and degree of saturation.

OR

- 3 A liquid limit test was conducted on a soil sample whose natural water content is 28%, plastic limit is 21% and following results were obtained:

Number of blows	10	19	23	27	40
Water content (%)	60	45.2	39.8	37	25

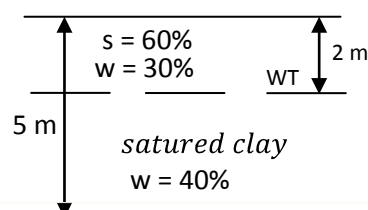
Draw the flow curve and determine: (i) Liquid limit. (ii) Liquidity index. (iii) Consistency index. (iv) Void ratio at liquid limit, if $G = 2.7$.

UNIT – II

- 4 (a) What are the assumptions of Darcy's law?
 (b) A sand sample of 35 cm^2 cross sectional area and 20 cm long was tested in a constant head permeameter. Under a head of 60 cm, the discharge was 120 ml in 6 min. The dry weight of sand used for the test was 1120 g, and $G_s = 2.68$. Determine; (i) the hydraulic conductivity in cm/sec, (ii) the discharge velocity; and (iii) the seepage velocity.

OR

- 5 Calculate and draw the total, effective and pore water pressure distribution for a soil profile with properties as shown in figure below. Assume $G = 2.7$.



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UNIT – III

- 6 The following data were obtained from standard proctor compaction test:

Water content (%)	8.3	10.5	11.3	13.4	13.8
Bulk unit weight (kN/m ³)	19.80	21.30	21.6	21.20	19.80

- (i) Plot the compaction curve and determine MDD and OMC.
(ii) Also draw ZAV line if $G = 2.65$.

OR

- 7 Construct a Newmark's chart having influence factor of 0.005 and explain the use of Newmark's chart to find vertical pressure at a point.

UNIT – IV

- 8 (a) Explain Casagrande's method of determining pre-consolidation pressure.
(b) Explain square root of time fitting method of determination of co-efficient of consolidation.

OR

- 9 Saturated soil of 5 m thick lies above impervious stratum and below pervious stratum. It has a compression index of 0.25 with $k = 3.2 \times 10^{-10}$ m/sec. Its void ratio at a stress of 150 kN/m² is 1.9. Compute: (i) The change in voids ratio due to increase of stress to 200 kN/m².
(ii) Coefficient of volume compressibility.
(iii) Coefficient of consolidation.
(iv) Time required for 50% consolidation.

UNIT – V

- 10 The stresses on a failure plane in a drained test on a cohesionless soil are as under:

Normal stress (σ) = 100 kN/m²

Shear stress (τ) = 40 kN/m²

Determine: (i) Shear strength parameters. (ii) Major and minor principle stresses. (iii) Direction of major and minor principle planes.

OR

- 11 Explain Coulomb's equation for shear strength of a soil. Discuss the factors that affect the shear strength parameters of soil.
