Code: 15A01503 **R15**

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)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Draw the three phase diagram for soil system and two phase diagram for saturated soil.

(b) Explain the significance of a grain size distribution curve.

(c) Write the expression of permeability in stratified soils when the flow is parallel and perpendicular to stratification.

(d) What are the uses of flow nets?

(e) Give the limitations of Boussinesq theory of stresses.

(f) Calculate compaction energy used in standard proctor test and modified proctor test.

(g) What is over consolidation ratio? Explain briefly with an example.

(h) Differentiate between primary consolidation and secondary consolidation.

(i) Explain the Mohr-Coulomb theory for shear strength of soils.

(j) 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.

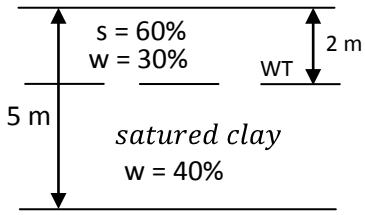
UNIT – II

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 Gs = 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 previous stratum. It has a compression index of 0.25 with k = 3.2 x 10^{-10} m/sec. Its void ratio at a stress of 150 kN/m^2 is 1.9. Compute: (i) The change in voids ratio due to increase of stress to 200 kN/m^2.
(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 $(\sigma) = 100\ kN/m^2$
Shear stress $(\tau) = 40\ kN/m^2$
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.

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