

CBCS Scheme

USN

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15CT53

Fifth Semester B.E. Degree Examination, June/July 2018 Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Define : i) Voids ratio ii) Porosity iii) Air content. (03 Marks)
- b. With usual notations, derive the relationship
$$\gamma_d = \frac{(1 - n_a)G\gamma_w}{1 + WG}$$
 (07 Marks)
- c. A core cutter of 100mm internal dia and 128mm height was used to determine the unit weight of soil at site. The total weight of core cutter and soil was 3015 gm and empty weight of core cutter was 1374gm. A representative sample of soil was kept in steep cup weight 60gm for the determination of water content. Weight of cup and soil before and after placing in oven were respectively 106.4 gm and 92 gm. Find dry unit weight of soil and degree of saturation if $G = 2.7$. (06 Marks)

OR

- 2 a. Define i) Liquid limit ii) Plastic limit iii) Shrinkage limit iv) Shrinkage ratio. (04 Marks)
- b. Explain three correction applied to hydrometer readings. (06 Marks)
- c. Classify the soils on the basis of data provided as per I.S classification : (06 Marks)

| Soil | % passing 4.75 nm | % passing 75 μ | C_u | C_c | W |
|------|-------------------|--------------------|-------|-------|--------------------------|
| A | 98 | 02 | 6.1 | 1.6 | $I_p = 04$ |
| B | 0 | 90 | - | - | $W_L = 60$ $W_P = 30$ |
| C | 40 | 10 | 5.7 | 1.8 | $W_L = 23$ $W_P = 13$ |

Module-2

- 3 a. With neat sketches, explain following soil structures : (08 Marks)
- i) Single grained ii) Honey combed iii) Flocculent and iv) Dispersed.
- b. With neat sketches, explain any two clay minerals. (08 Marks)

OR

- 4 a. Differentiate between Standard and Modified proctor tests. (04 Marks)
- b. Briefly explain factors affecting Compaction. (06 Marks)
- c. During compaction test, a soil attains a maximum dry density of 18kN/m^3 at water content of 12%. The specific gravity of soil is 2.67. Determine the degree of saturation. % air voids at maximum dry density. Also find the theoretical maximum dry density corresponding to zero air voids at the optimum moisture content. (06 Marks)

Module-3

- 5 a. List various factors affecting permeability of soils. (06 Marks)
- b. Explain Quick sand and Capillary phenomena. (06 Marks)
- c. If a glass tube of 0.002mm dia is immersed in water, what is the height to which will rise in the tube by capillary action. (04 Marks)

OR

- 6 a. Write Laplace equation for a steady, two dimensional flow through an isotropic soil and mention the assumptions made. (06 Marks)
- b. Explain Total and Effective stresses in soil. (04 Marks)
- c. In a falling head test permeability test initial head of 1.0m dropped to 0.35M in 3 hours. The diameter being 5mm. The soil specimen is 200mm long and 100mm in dia. Calculate coefficient of permeability of the soil. (06 Marks)

Module-4

- 7 a. Explain Casagrande's method of determination of preconsolidation pressure. (06 Marks)
- b. Differentiate Compaction and Consolidation. (04 Marks)
- c. A soil sample and 20mm thick take 20 minutes to reach 20% consolidation. Find the time taken for a clay layer 6m thick to reach 40% consolidation. Assume double drainage in both cases. (06 Marks)

OR

- 8 a. Explain with Spring analogy, Terzaghi's theory of one dimensional consolidation. (06 Marks)
- b. Explain the theoretical basis for the Logarithmic time fitting method for the determination of coefficient of consolidation. (06 Marks)
- c. In a consolidation test voids ratio decreased from 0.7 to 0.6 when load was changed from 50kN/m² to 500kN/m². Compute coefficient of compressibility and coefficient of volume change. (04 Marks)

Module-5

- 9 a. Explain Mohr – Coulomb theory. (06 Marks)
- b. Explain Sensitivity and Thixotropy of clay. (06 Marks)
- c. What is the Shear strength in terms of effective stresses on a plane within a saturated soil mass at a point, where the total normal stress is 295 KPa and pore water pressure 120KPa? The effective shear strength parameter C' and Q' are 12KPa and 30°. (04 Marks)

OR

- 10 a. How the Shear tests are classified on the basis of drainage conditions? (06 Marks)
- b. List various factors affecting Shear strength. (04 Marks)
- c. A sample of compacted, clean dry sand were tested in a shear box, 6cm × 6cm and following results were obtained. (06 Marks)

| | | | | |
|-------------------------|-----|-----|-----|-----|
| Normal load (N) | 100 | 200 | 300 | 400 |
| Peak shear load (N) | 90 | 181 | 270 | 362 |
| Ultimate shear load (N) | 55 | 152 | 277 | 300 |

Determine the angle of Shearing resistance of sand in (a) dense and (b) loose state.

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