Hall Ticket No | | | | | | | | | | | Question Paper Code: ACEC24

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VI SEMESTER END EXAMINATIONS (REGULAR) - JULY 2023
Regulation: UG-20
GEOTECHNICAL ENGINEERING

Time: 3 Hours **CIVIL ENGINEERING** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Explain the grain size distribution curves for different type of soils with neat sketch. [BL: Understand| CO: 1|Marks: 7]

   (b) A partially saturated sample of soil has a volume of 60 cc and mass of 92 g. The sample is dried in an oven and its dried mass is 73.8 g. If the specific gravity of solids be 2.62, find the degree of saturation, water content, void ratio, porosity, bulk unit weight and dry unit weight. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Enumerate the properties, uses and application of flow net. Determine the Darcy's law of permeability of soil. [BL: Understand| CO: 2|Marks: 7]

   (b) In a falling head permeameter test, the initial head (t = 0) is 40 cm. The head drops by 5 cm in 10 minutes. Calculate the time required to run the test for the final head to be at 20 cm. If the sample is 7 cm in height and $60cm^2$ in cross-sectional area, calculate the coefficient of permeability, taking area of stand pipe = 0.6 cm^2 . [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) Summarize the laboratory procedure to determine maximum dry density and optimum moisture content by using standard compaction test. [BL: Understand| CO: 3|Marks: 7]

   (b) A concentrated load of 2000 KN is applied at the ground surface. Determine vertical stress at a point P which is 6 m directly below the load. Also calculate the vertical stress at a point R, which is at a depth of 6 m but a horizontal distance of 5 m from the axis of the load. [BL: Apply| CO: 3|Marks: 7]

4. (a) State the different modes of soil water. Discuss the effect of compaction on various engineering properties of soils. [BL: Understand| CO: 4|Marks: 7]

   (b) The maximum unit weight of compacted soil mass is found to be $18kN/m^3$ with optimum water content being 15%. Find the values of porosity and degree of saturation of this compacted soil. Also find the maximum dry unit weight on the zero air void line at that water content. Take the specific gravity of soil solid as 2.70. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Find the equation for Terzaghi's theory of one dimensional consolidation with a neat sketch. [BL: Understand| CO: 5|Marks: 7]

   (b) A 3 m thick layer saturated clay in the field under a surcharge loading will achieve 90% consolidation in 75 days in double drainage conditions. Find the coefficient of consolidation of clay. [BL: Apply| CO: 5|Marks: 7]

6. (a) Summarize about e-p and e-log p curves. Describe in detail the laboratory determination of coefficient of consolidation. [BL: Understand| CO: 5|Marks: 7]

   (b) A 6 m thick saturated soil stratum has a compression index of 0.28 and coefficient of permeability 3.5×10^{-4} cm/sec. If the void ratio is 1.95 m at vertical stress of 150 kN/m^2, compute the void ratio when the vertical stress is increases to 210 kN/m^2. Estimate the settlement due to above stress increase and time required for 50% consolidation. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Outline the Mohr's-Coulomb failure theories for sandy soils and comment on the shear strength parameter. [BL: Understand| CO: 6|Marks: 7]

   (b) A cylindrical specimen of saturated clay, 4 cm in diameter and 9 cm in overall length is tested in an unconfined compression tester. The specimen has coned ends and its length between the apices of cones is 8 cm. Find the unconfined compressive strength of clay, if the specimen fails under an axial load of 46.5 N. The change in length of specimen at failure is 1 cm. [BL: Apply| CO: 6|Marks: 7]

8. (a) Elaborate the basic mechanism of shear strength of soils. Describe in detail the direct shear test for finding shear parameters of soil. [BL: Understand| CO: 6|Marks: 7]

   (b) An embankment, 5 m high, is made up of soil whose effective stress parameter are c' = 50 kN/m^2 and ϕ' = 16°, and $\gamma = 16.2kN/m^3$. The pore pressure parameter as found from triaxial test are A = 0.40 and B = 0.92. Find the shear strength of the soil at the base of the embankment just after the fill has been raised from 5 m to 9 m. Assume that the dissipation of pore pressure during this stage of construction is negligible, and that the lateral pressure at any point is one-half of the vertical pressure. [BL: Apply| CO: 6|Marks: 7]

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