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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular / Supplementary) - May, 2019

Regulation: IARE – R16

GEOTECHNICAL ENGINEERING

Time: 3 Hours

(CE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) What are the different types of soil structures which can occur in nature? Describe in brief. [7M]

(b) The density of a partially saturated soil was found to be 1.88gm/cc. If the moisture content and void ratio of the soil are 24.8% and 0.76 respectively, determine the specific gravity of solids and the degree of saturation. [7M]
- (a) With the help of three phase diagram, define the following: (i) Voids ratio (ii) Porosity (iii) Degree of saturation (iv) Water content (v) Absolute/true specific gravity (vi) Apparent specific gravity (vii) Air content [7M]

(b) An undisturbed soil sample has a plastic limit 25%, a natural moisture content of 40%, and a liquidity index of 50%. What will be its liquid limit? [7M]

UNIT – II

- (a) What is flow net? List out the properties and applications of flow net. Sketch flow net. [7M]

(b) A homogeneous earth dam, 30m high, has a free board of 1.5m. A flow net was constructed and the following results were noted. Number of potential drops=12; Number of flow channels = 3. The dam has an 18m long horizontal filter at its downstream end. Calculate the seepage loss across the dam per day if the width of the dam is 200m and the coefficient of permeability of the soil is 3.55×10^{-4} cm/sec. [7M]
- (a) Differentiate between absorbed and capillary water in soils? Write the expression for determining height of capillary rise in small diameter pipe and in soils respectively. [7M]

(b) A horizontal stratified soil deposit consists of three uniform layers. The permeabilities of these layers are 8×10^{-4} cm/s, 52×10^{-4} cm/s, and 6×10^{-4} cm/s, and their thicknesses are 7, 3 and 10 m respectively. What is the ratio of the effective average permeability of the deposit in the horizontal and vertical directions? [7M]

UNIT – III

5. (a) Define the terms with neat sketch. [7M]
i) Mechanism of compaction
ii) Compaction phenomenon
iii) Effects of Compaction
iv) Pressure bulb
- (b) A vertical concentrated force of 40 kN is acting at a point on the ground surface. Determine the vertical stress intensities due to this load at a depth of 2.5 m below GL on the line of action of load and at a depth of 1.5 m below GL and a radial distance of 3m. (Use Westergaard's method). [7M]
6. (a) Differentiate between Boussinesq's theory and Westergaard's theory. [7M]
- (b) A rectangular foundation, 2m x 4m, transmits a uniform pressure of 450 kN/m² to the underlying soil. Determine the vertical stress at a depth of 1m below the foundation at a point with in the loaded area, 1m away from the short edge and 0.5m away from the long edge. Use Boussinesq's theory. [7M]

UNIT – IV

7. (a) Explain the square root of time fitting method for evaluating coefficient of consolidation. [7M]
- (b) The void ratio of clay A decreased from 0.572 to 0.505 under a change in pressure from 120 to 180 kg/m². The void ratio of clay B decreased from 0.612 to 0.597 under the same increment of pressure. The thickness of sample A was 1.5 times that of B. Nevertheless, the time required for 50% consolidation was three times longer for sample B than for sample A. What is the ratio of the coefficient of permeability of A to that of B? [7M]
8. (a) Differentiate between primary consolidation and secondary consolidation. [7M]
- (b) A reinforced concrete foundation, of dimensions 18 m × 36 m, exerts a uniform pressure of 180 kN/m² on a soil mass and $\mu=0.5$, with E-value 45 × 10³ kN/m². Determine the value of immediate settlement under the foundation [7M]

UNIT – V

9. (a) Sketch stress strain diagrams for loose sand, dense sand, soft clay and stiff clay and comment. [7M]
- (b) The following test data shown in Table 1 is obtained from a triaxial test. [7M]

Table 1

Test No.	Chamber pressure (kN/m ²)	Deviator stress (kN/m ²)	Pore pressure at max. deviator stress (kN/m ²)
1	80	175	45
2	150	240	50
3	210	300	60

Determine the total and effective stress parameters of the soil.

10. (a) Describe direct shear test. Enlist the merits and demerits [7M]
(b) Results of CU tests conducted on two saturated clay samples are given in Table 2. Determine the shear strength parameters. [7M]

Table 2

	Sample1	Sample2
Confining pressure	4.8 kg/cm ²	6.3 kg/cm ²
Axial stress at failure	6.8 kg/cm ²	9.3 kg/cm ²
Pore water pressure at failure	3.8 kg/cm ²	4.8 kg/cm ²

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