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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Supplementary) - July, 2018

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 corrections to be applied in hydrometer analysis? Explain. [7M]

(b) A saturated sample of undisturbed clay has a volume of 19.2cm^3 and weighs 32.5g. After oven drying, the weight reduces to 20.2g. Determine the following [7M]
 (i) Water content (ii) Specific gravity (iii) Void ratio (iv) Saturated density of clay sample.
- (a) Explain in brief about Montmorillonite and Illite mineral. [7M]

(b) What are the different types of soil structures? Explain them with neat sketch. [7M]

UNIT – II

- (a) Write short notes on quick sand condition. [7M]

(b) Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of three layer of thickness 5m, 1m and 2.5m and having the coefficient of permeability of 3×10^{-2} mm/sec, 3×10^{-5} mm/sec and 4×10^{-2} mm/sec respectively. Assume the layers are isotropic. [7M]
- (a) A sample in a variable head permeameter is 8 cm in diameter and 10 cm high. The permeability of the sample is estimated to be 10×10^{-4} cm/s. If it is desired that the head in the stand pipe should fall from 24 cm to 12 cm in 3 min., determine the size of the stand pipe which should be used. [7M]

(b) What are the various parameters that affect the permeability of soil in the field? Critically discuss. [7M]

UNIT – III

- (a) Describe the assumptions to be taken in Boussinesq's theory and write the equation of stress for a concentrated point load. [7M]

(b) The maximum dry density of a sample by the light compaction test is 1.78 gm/cc at an optimum water content of 15%. Find the air voids and degree of saturation. Specific gravity $G=2.67$. What would be the corresponding value of dry density on the zero air void line at OMC? [7M]

6. (a) What are various effects of compaction on properties of soil? Explain them in detail. [7M]
(b) Explain the following: [7M]
i. Isobar
ii. Geostatic stress
iii. Assumptions used in Westergard's theory
iv. Formula for vertical stress under circular area

UNIT – IV

7. (a) Discuss the assumptions in Terzaghi's theory of consolidation. [7M]
(b) A clay layer 4m thick is subjected to a pressure of $55\text{kN}/\text{m}^2$. If a layer has double drainage and undergoes 50% consolidation in one year, determine the coefficient of consolidation. Take $T_v=0.196$, if the coefficient of permeability is $0.020\text{m}/\text{yr}$. Determine the settlement in one year and rate of flow of water per unit area in one year? [7M]
8. (a) Define and explain initial consolidation, primary and secondary consolidation. [7M]
(b) The laboratory consolidation data for an undisturbed clay sample are as follows. $e_1=1.00$, $\sigma_1=85\text{kN}/\text{m}^2$, $e_2=0.80$, $\sigma_2=465\text{kN}/\text{m}^2$. Determine the void ratio for a pressure σ_3 of $600\text{kN}/\text{m}^2$. [7M]

UNIT – V

9. (a) Draw the neat sketch of triaxial compression test apparatus. Explain its components and working principle. [7M]
(b) A sample of dry cohesionless soil was tested in a triaxial machine. If the angle of shearing resistance was 36° and confining pressure $100\text{kN}/\text{m}^2$, determine the deviator stress at which the sample failed. [7M]
10. (a) What type of field tests is necessary for determining the shear strength parameters of sensitive clays? Derive the relationships that are useful for analyzing the observations of this test. [7M]
(b) A shear vane of 7.5cm diameter and 11cm length was used to measure the shear strength of the soft clay. If a torque of 600 N-m was required to shear the soil, Calculate the shear strength. [7M]

