Code No: 125EQ **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, May - 2018
GEOTECHNICAL ENGINEERING
(Common to CE, CEE)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) A fully saturated soil sample has a water content of 35% and specific gravity of 2.65. Determine its porosity, saturated unit weight and dry unit weight. [2]
b) A clay soil has a liquid limit of 62% and plastic limit of 34%. Classify the soil as per the IS classification. [3]
c) The effective size of a silt is 0.01 mm. The void ratio is 0.7. What is the height of capillary rise of water in this soil? [2]
d) Define the terms discharge velocity and seepage velocity. [3]
e) State the Boussinesq's and Westergaard's theories for point load. [2]
f) Explain briefly the mechanism of compaction. [3]
g) How do you determine the pre-consolidated pressure? [2]
h) Write a short note on stress history of clay. [3]
i) Define the term dilatancy. [2]
j) Explain Liquefaction. [3]

PART - B

(50 Marks)

2.a) A clay soil has a liquid limit of 52%. The volume of the soil sample in the shrinkage dish at the liquid limit is 0.0401×10^{-3} m^3 and its shrinks to a volume of 0.0261×10^{-3} m^3 at the shrinkage limit. The specific gravity of solids is 2.72. Determine the shrinkage limit of the soil.
b) Write a brief note on soil formation. [5+5]

OR

3.a) Distinguish between the residual soil and transported soil.
b) What are building blocks of clay minerals? Explain three common groups of clay minerals. [5+5]

4.a) Discuss the different methods to determine the permeability of a soil sample?
b) A saturated sand layer over a clay stratum is 5m in depth. The water is 1.5 m below ground level. If the bulk density of saturated sand is 1.8 g cc^{-1}, calculate the effective and neutral pressure on the top of the clay layer. [5+5]

OR

5.a) Discuss briefly the merits and demerits of different methods determining permeability and special applications.
b) Write a short on characteristics of flow net. Give its uses. [5+5]

6.a) A concentrated point load of 200 kN acts at the ground surface. Find the intensity of vertical pressure at a depth of 10 meters below the ground surface, and situated on the axis of loading. What will be the vertical pressure at a point at a depth at 5 m and at a distance of 2 m from the axis of loading? Use Westergaard analysis taking $\mu = 0$.

b) Discuss the factors which affect compaction of soils in embankments. [5+5]

OR

7. Describe briefly about Newmark's influence chart for irregular areas. [10]

8.a) How do you estimate the field e-p curve of an over consolidated clay?

b) Briefly explain the physical meaning of the coefficient of consolidation. [5+5]

OR

9.a) Why does it take infinite time for complete consolidation to occur?

b) Explain the Terzaghi's 1-D consolidation theory. [5+5]

10.a) Define critical void ratio. Explain the shear behavior of a soil whose void ratio is less than the critical ratio.

b) A vane of 80 mm diameter and 160 mm height has been pushed into an in-situ soft clay at the bottom of a bore hole. The torque required to rotate the vane was 76 N-m. Determine the undrained shear strength of the clay. After the test, the vane was rotated several times and the ultimate torque was found to be 50 N-m. Estimate the sensitivity of the clay. [5+5]

OR

11.a) Discuss the type of laboratory triaxial test you would recommend for the initial stability of a foundation on saturated clay.

b) Explain why the angle of failure plane observed in a shear test might differ more often from that predicted from Mohr diagram at failure. [5+5]

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