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ET-501(A)

02305

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2010

ET-501(A) : SOIL MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any five questions. Assume any missing data. Use of calculator is permitted. Notations used in the questions carry their usual meaning.*

1. (a) Explain how the liquid limit of a fine grained soil is determined in the laboratory ? 7

   (b) A soil sample, whose water content is 18%, has a bulk density 21.8 kN/m^3. The sample undergoes air drying with insignificant change in void ratio. What is the water content of this sample when its bulk density reduces to 19.7 kN/m^3 ? 7

2. (a) Derive an expression for the estimation of percentage finer than a given diameter from the reading of hydrometer analysis. 7

   (b) What do you mean by group Index? How is it estimated ? 7

3. (a) Define Permeability. A sample of clay of cross sectional area 80 cm^2 and length 5cm, is subjected to falling head permeability test. The area of stand pipe is 0.50 cm^2 and during the test, head dropped from 70 cm to 40 cm in 65 minutes. Compute the coefficient of permeability. 7

(b) Discuss the factors affecting compaction 7

4. (a) Discuss the significance of potential and stream function. Define flow net. 7

(b) Water is flowing at the rate of 0.08ml / sec. in an upward direction through a sample of silty sand whose hydraulic conductivity is 2.4×10^{-3} cm/sec. The thickness of the sample is 18 cm and its cross sectional area is 50 cm^2. Determine the effective stress at the middle and bottom section of the sample. The saturated unit weight of the soil sample is 2 g/cc. 7

5. (a) What are the assumptions of Boussinesq's equation ? Write the expression for vertical normal stress and shear stress at any point in the soil mass subjected to a point load at the surface. 7

(b) A line load of 200 kN/m extends to a very long distance. Calculate the vertical normal stress at a point 4m below the surface 7

(i) directly under the line load

(ii) at a distance 3m perpendicular to the line load.

6. (a) Explain with a suitable example how the consolidation settlement is estimated ? 7

(b) The consolidation settlement of 4 m thick clay layer is found to be 140 mm. The layer is having double drainage and coefficient of consolidation of the clay is found to be 2.4×10^{-4} cm^2 / sec. Determine the time-rate of consolidation settlement. 7

7. (a) Discuss the factors affecting shear strength of a soil. 7

(b) An unconfined compressive test was conducted on a specimen of a saturated clay 38mm diameter and 76 mm long. The sample failed at a load of 250 N and determination at failure was 10 mm. Find unconfined compressive strength of the soil. 7

8. (a) Discuss the stability of slopes under following conditions. 7

(i) Steady seepage condition

(ii) Sudden drawdown condition

(b) What are the methods for improving the stability of slopes ? Discuss briefly. 7