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ET-501(A)

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

Term-End Examination

June, 2012

ET-501(A) : SOIL MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any five** questions. Assume **specific gravity** of the soil as 2.65.*

1. (a) Explain how liquid limit of a fine grained soil is determined ? What are the limitations of liquid limit test by casagrands apparatus ? 7

(b) The initial water content of a soil is 12% at a void ratio 0.65. Determine the quantity of water to be added to one m^3 of the soil in order to saturate it completely. 7

2. (a) What is isomorphous substitution ? Explain the structure of clay minerals. 7

(b) The results of sieve analysis of fine grained soil are as follows : 7

Sieve size (mm)	% passing
2.0	100%
0.425	80%
0.075	45%
0.002	20%

The liquid limit, plastic limit and shrinkage limits of the same soil are 30%, 20% and 12% respectively. Determine the activity of the soil. Also predict the presence of type of mineral.

3. (a) Explain how coefficient of permeability is determined by variable head permeameter ? Derive the relation used. 7

(b) The profile of a soil deposit is shown in figure 1. Draw the variation of effective stress. Take unit weight of water as 10 kN/m^3. 7

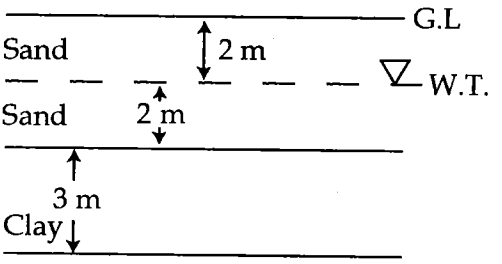

Figure - 1

The unit weights of Sand above and below water table (WT) are 17 and 20 kN/m^3 and that of clay is 16 kN/m^3.

4. (a) Write a note on field compaction. 7

(b) Prove that equipotential lines and stream lines are mutually orthogonal. Write Laplace equation and explain its significance. 7

5. (a) Justify the assumptions of Boussinesq's equation. Write the equation in cylinderical coordinate. 7

(b) Draw the non dimensional plot of vertical stress Vs depth below the centre of an uniformaly loaded circular area. Take the intensity of load as q kN/m^2 and radius of circular area as R (m). 7

6. (a) Explain Oedometer test. How compressibility parameters are determined ? 7

(b) A 3 m thick uniform fill (compacted unit weight 20 kN/m^3) is placed at the site where the soil profile is shown in figure 2. Determine the consolidation settlement. 7

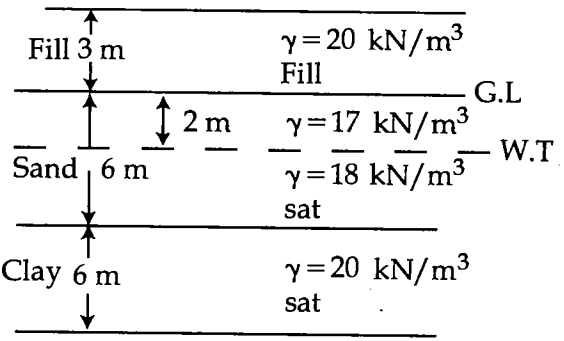

Figure - 2

Take $\gamma w = 10$ kN/m^3, $Cc = 0.20$

Initial void ratio is 0.65.

7. (a) Explain Mohr - coulomb theory of shear strength of a soil. What are the factors affecting shear strength ? 7

(b) The failure torque in a field test on a saturated clay deposit was observed to be 40 NM. The vane was 60 mm wide and 120 mm long and the vane was pushed into the clay completely. Find the shear parameters of the clay. 7

8. (a) Explain Swedish circle method for finding safety factor. 7

(b) Explain various methods for the improvement of upstream slope which may fail due to sudden draw down conditions. 7