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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

December, 2012

ET-501(A) : SOIL MECHANICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Derive relation amongst specific gravity, void ratio, water content and degree of saturation. Define each of the terms also. 7

   (b) What are the limitations of hydrometer test ? Discuss various types of correction used for taking the reading of hydrometer. 7

2. (a) A soil whose liquid and plastic limits are 60% and 25% respectively. The solids excavated from a borrow pit for placement in an embankment. The natural water content of the excavated soil is 30%. Find plasticity index, liquidity index, consistance index and toughness index, if flow index is 45%. 7

   (b) Explain building blocks of clay minerals. Discuss nature of water in clay. 7

3. (a) Explain the concept of effective stress. How effective stress affects compressibility and shear strength of the soil ? 7

(b) A sample of clay, having cross-sectional area of 80 cm^2 and length of 6 cm is subjected to falling head permeability test. The area of stand pipe is 0.50 cm^2 and during the test head drops from 80 cm to 40 cm in 1 hr and 30 min. Find the hydraulic conductivity of soil. 7

4. (a) Explain how Standard Proctor test is performed ? Discuss compaction curves for different soils. 7

(b) The results of Standard Proctor tests on a soil are as follows : 7

Draw compaction curve and determine OMC and MDD. Also draw 5% constant air void line take $r_w = 10\ kN/m^3$.

Water Content (%)	7.0	8.5	9.5	11.0	12.0	13.0
Wet Density (kN/m^3)	21.0	22.5	22.2	21.2	20.8	20.0

5. (a) What is quick sand phenomena ? Derive the equation for critical gradient. Find critical gradient for void ratio 0.63. 7

(b) What is pressure bulb ? A foundation area of size 3.0 m × 3.0 m carries an uniformly distributed load of 300 kN/m^2, calculate the vertical stress at a point 6.0 m below the centre of the foundation. 7

6. (a) What is the difference between normally consolidated and pre-consolidated clay ? How the pre-consolidation pressure is determined ? 7

(b) Explain sand drain. Write down the differential equation in cylindrical coordinate system for three dimensional consolidation process. 7

7. (a) Explain direct shear test. What are the limitations of this test ? 7

(b) An unconfined compressive test was conducted on a specimen of saturated clay 38 mm in diameter and 76 mm long. The sample failed at a load of 180 N and the deformation at failure was 9.5 mm. Find the unconfined compressive strength and cohesion of the clay. Also draw Mohr's circle. 7

8. (a) Discuss the factors affecting stability of slopes in detail. 7

(b) What is the role of geotextile for the improvement of slope stability. Discuss the placement of geosynthetics at U/S and D/S slopes, at filter and at the interface of core and shell of earthen dam. 7