(Please write your Exam Roll No.) Exam Roll No. 400/600346

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCE-210 **Subject: Soil Mechanics (Batch 2013 Onwards)**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q no.1 which is compulsory.

Q1 (a) Fill in the blanks- **(10x1=10)**

(i) Relative density is defined as .....
(ii) The liquid limit and plastic limit of soil are 65% and 35% respectively. The soil is classified as ....
(iii) The dry density of a saturated soil with water content 16% and specific gravity 2.66 will be .....
(iv) With the increase in liquid limit of the soil, compressibility will of the soil ....
(v) In the dam body the exit gradient of a soil is 0.67. The specific gravity and void ratio of the soil are 2.67 and 0.67 respectively. The condition of the dam in downstream side will be ...
(vi) The water content of the soil at the site is determined by ....
(vii) The applications of flow net in soil mechanics are ...
(viii) In zoned dam the core section is compacted on .... side of OMC.
(ix) In UU test on saturated clay, the angle of shearing resistance will be ....
(x) The methods adopted for finding the coefficient of consolidation are ...

(b) (i) Define quick sand and quick clay **(3)**
(ii) Explain how the shrinkage limit is obtained **(3)**
(iii) Explain assumptions of Terzaghi's theory of one dimension consolidation. **(3)**
(iv) How the permeability of silty clay is obtained. **(3)**
(v) What are the limitation of Boussinesq's theory. **(3)**

Q2 (a) Derive relation between dry density, air porosity, specific gravity and water content of the soil. **(6.5)**
(b) Explain clay minerals with neat sketches. **(6)**

Q3 (a) A 60 gm of oven dried soil passing through 75 micron sieve was used for hydrometer test. In one litre soil suspension the corrected hydrometer reading after 3 min was 25. The effective depth corresponding to this reading is 12.2 cm. If the viscosity of water is 0.012 Poise, determine the coordinates of the point on gradation curve. Assume specific gravity of the soil is 2.68. **(6.5)**
(b) Explain plasticity chart for classification of fine grained soils. **(6)**

Q4 (a) Explain the electrical analogy method for the construction of flow net. **(6)**
(b) What is soil suction? What are its ill effects? **(6.5)**

Q5 (a) A standard Proctor's compaction test was conducted on a soil sample, and the following observations were made: **(6.5)**

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Water Content (%)	8.12	11.71	14.83	17.60	20.21	21.71
Mass of wet Soil (kg)	1.68	1.91	2.05	1.98	1.94	1.89

The diameter and height of the mould used were 10 cm and 12.5 cm respectively. Plot the compaction curve and find maximum dry density and optimum moisture content. Determine void ratio, degree of saturation and zero air void line. Also draw zero air void line

(b) A layer soil saturated clay 6m thick is overlain by sand 4m deep. The water table is 3m below the top surface. What will be increase in effective stress at 1om, if the soil get saturated by capillary action upto a height of 1m above water table. The saturated unit weight of sand and clay are 19.0 kN/m^3 and 17.5 kN/m^3 respectively. The unit weight of sand above water table is 17.0 kN/3.m **(6)**

Q6 (a) Discuss vane shear test. **(6)**

(b) Discuss the factors affecting shear strength of coarse grained soil. **(6.5)**

Q7 (a) Direct shear test was performed on a sample of dry sand. Under a normal stress of 1.5 Kg/cm^2, failure occurred when the shear stress reached 0.7 Kg/cm^2. Draw the Mohr's circle and Mohr's envelope also determine the orientation of principal planes and the magnitude of principal stresses. **(6.5)**

(b) Two clay specimens A and B of thickness 2.5cm and 3.5cm, has equilibrium void ratios 0.63 and 0.73 respectively under a pressure of 200kN/m^2. If the equilibrium void ratios of the soils reduced to 0.46 and 0.61 respectively when the pressure was increased to 400kN/m^2. Find the ratio of hydraulic conductivities of the two specimens. The time required by the spectrum A to reach 50% degree of consolidation is one fourth of that of specimen B for the same degree of consolidation. **(6)**

Q8 Write short notes on following:-

(a) Pore pressure parameters **(3.5)**

(b) Pre consolidation pressure **(3)**

(c) Effective stress principle **(3)**

(d) Proctor's needle **(3)**

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