6. (a) What are the merits and demerits of triaxial test?

(b) An unconfined compression test was performed on a undisturbed clay specimen. The sample had a diameter of 38 mm and length of 76 mm. The load at failure was 30 N and the axial deformation of the sample was 10mm. Determine the undrained shear parameters of soil if the failure plane made an angle of 40° with vertical.

7. (a) In a falling head permeability test, it took 40 s for the head to drop from 600 mm to 300 mm. Find the time required to run the test from initial head of 600 mm to a final head of 200 mm. Determine the coefficient of permeability of soil if the cross sectional area and length of soil specimen are 78.5 cm^2 and 6.0 cm respectively. The diameter of stand pipe used in the test is 0.5 cm.

(b) Explain how depth of exploration is decided in various civil engineering projects.

8. Write notes on the following:

(a) Limitations of sedimentation analysis

(b) Quick sand condition

(c) Influence diagram.

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III/IV B.E. DEGREE EXAMINATION.

First Semester

Civil Engineering

GEOTECHNICAL ENGINEERING – I

(Common with Civil Environmental Engineering and Dual Degree Programme in Civil Engineering)

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

First question is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) Derive relation between 'void ratio' and 'porosity'.

   (b) Distinguish between "Flow index" and "Toughness Index".

   (c) What is the significance of "A-line" used plasticity chart?

   (d) What are the limitations of Darcy's law?

(e) Distinguish between "Normally consolidated" and "over consolidated" soils.

(f) What is "failure envelope"? Draw typical failure envelopes for pure cohesive and cohesionless soils.

(g) What is "Standard Penetration Resistance"?

2. (a) Derive the relation

$$\gamma_d = \left(\frac{1-n_a}{1+wG}\right) G\gamma_w$$

where, γ_d is dry unit weight of soil

γ_w is unit weight of water

w is water content

G is specific gravity of soil grains

n_a is percentage of air voids.

(b) A partially saturated soil from an earth fill has a natural water content of 19% and a bulk unit weight of 19 kN/m^3. Assuming the specific gravity of soil solids as 2.7, compute the degree of saturation and void ratio. If subsequently the soil gets saturated, determine the dry density, buoyant unit weight and saturated unit weight.

3. (a) Describe the various factors affecting compaction of soils.

(b) Classify the soil with following properties as per Indian Standard Soil Classification System.

(i) Soil fraction passing 4.75mm sieve = 72

(ii) Soil fraction passing 0.075 mm sieve = 18

(iii) Liquid limit = 34%

(iv) Plastic limit = 21%.

4. (a) Derive the expression for finding vertical stress at a depth 'z' below centre of circularly loaded area subjected to uniformly distributed load of intensity 'q'.

(b) Distinguish between 'Boussinesq' and 'Westergaard' theories of stress distribution in soils.

5. (a) State the assumptions made in Terzaghi's one dimensional consolidation theory. Write differential equation of 1-D consolidation.

(b) A 10 mm thick laboratory soil specimen reaches 60% consolidation in 30 second under double drainage condition. Find how much time will be required for a 10 m thick soil layer in the field to reach 50% consolidation if it has drainage face on one side only.