GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 714301N   **Date: 23-12-2013**
Subject Name: Advanced Geotechnical Engineering
Time: 10.30 am – 01.00 pm   **Total Marks: 70**
Instructions:
    1. **Attempt any Five questions.**
    2. **Make suitable assumptions wherever necessary.**
    3. **Figures to the right indicate full marks.**

Q.1 **(a)** Discuss Terzaghi's theory of consolidation, stating the various assumptions and their validity.   **07**

    (b) Following compression readings were recorded during a consolidometer test on a saturated clay specimen (G = 2.73), when the pressure was increased from 50 to 100 kN/m^2.   **07**

Time in min.	0	0.1	0.25	0.50	1.0	2.0	4.0	8.0
Dial reading mm $\times 10^{-2}$	100.7	108.5	111	112.8	115	118.3	123	130
Time in min.	15	30	60	135	240	1180	1600	2625
Dial reading mm $\times 10^{-2}$	139.5	151	162	170.5	175	185	187	190

After 2625 minutes, the thickness of the specimen was measured as 37.13 mm and the water content as 16%. Determine the coefficient of consolidation from the root time plot, and the values of the three compression ratios. Determine also the coefficient of permeability. Also determine the C_v value from log time plot.

Q.2 **(a)** Explain Newmark's influence chart with its importance.   **07**
    (b) Give different types of shear tests based on drainage conditions. Explain how the pore water pressure variation and volume change take place during tests. Also enumerate the field conditions which necessitate each of these tests.   **07**

Q.3 **(a)** What is critical void ratio? How would you determine it in the laboratory? Also explain the conditions causing liquefaction of sand.   **07**
    (b) A certain sand sample is just at the point of failure in a triaxial test. The major and minor principal stresses are 400 and 100 kN/m^2. Draw the Mohr diagram and determine the direct & shearing stresses and obliquity angle on the plane of maximum shear and the plane of maximum obliquity.   **07**

Q.4 **(a)** What is stress path? Give its importance. Which different stress paths are generally used by engineers? Draw stress path for embankments, excavation, active earth pressure and passive earth pressure.   **07**
    (b) A 7.5 m thick saturated soil layer has drainage at top and bottom. Cv of the layer is 1.65×10^{-3} cm^2/s. Determine the excess pore water pressure in the middle of the layer 400 days after application of surcharge of intensity 2 kg/cm^2. What is the average degree of consolidation at that time?   **07**

Q.5 (a) A single row of sheet pile structure is shown in Figure **07**

Impervious layer
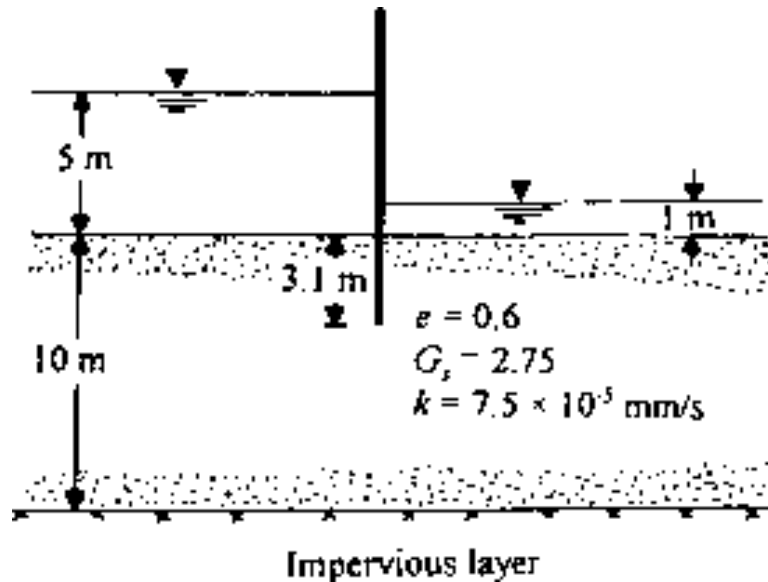
a. Draw the flow net.
b. Calculate the rate of seepage.
c. Calculate the factor of safety against piping

(b) Discuss factors affecting permeability in detail. **07**

Q.6 (a) Write and explain the Boussinesq's equation for stress distribution in soil for **07**
   (i) a point load and
   (ii) Line load.

(b) A square footing 2m x 2m carries a uniformly distributed load of 314 kN/m². Find the intensity of **07** vertical pressure at a depth of 4 m below a point 0.5 m inside each of two adjacent sides of the footing.

Q.7 The hydraulic conductivity of a clayey soil is 3×10^{-7} cm/sec. The viscosity of water at 25^0C is **04** 0.0911×10^{-7} g. sec/cm². Calculate the absolute value of K.

Which test you will perform to find out "k" for fine grained soil. Derive the equation for the same. **05**
What is field consolidation curve? How is it obtained? **05**

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