Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2015

Subject Code:150604 **Date: 07/05/2015**

Subject Name: Geotechnical Engineering-I

Time:02.30pm-05.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Draw three phase diagram of soil and derive the relation **07**

$$\gamma_b = \frac{(G + e.\,Sr)\,\gamma_w}{1 + e}$$

The letters have usual meaning.

(b) Void ratio of a soil sample is 30 % . If max. and min. dry density of soil sample are 2.0 gm/cc and 1.6 gm/cc respectively, calculate density index of soil. Specific gravity of soil is 2.5. **07**

Q.2 **(a)** Explain use of particle size distribution curve with meaning of D_{10}, D_{30}, D_{60} coefficient of uniformity - Cu and coefficient of curvature – Cc . **07**

(b) Explain consistency limits with graph. **07**

OR

(b) A test was carried out to determine liquid limit of a soil sample. Following observations were recorded. Plot the flow curve and determine the liquid limit and flow index of the soil. **07**

Water content %	18	24	30	35
No. of blows - N	55	35	20	12

Q.3 **(a)** What are the purposes of soil classification? Explain IS method of soil classification. **07**

(b) A sand layer of 6m thickness is lying over a clay stratum. The water table is 2m below ground level. If bulk density of saturated sand is 18 kN/m^3, calculate effective and pore pressure on the top of clay layer. Sp. Gravity G=2.60 **07**

OR

Q.3 **(a)** State Darcy's law of permeability and explain factors affecting permeability. **07**

(b) A horizontal stratified deposit of three layers of soil having thickness of 4m, 3m and 5m respectively. The coefficient of permeability of corresponding layer id 3.5 x 10^{-3} cm/s, 6.5 x 10^{-3} cm/s and 8 x 10^{-5} cm/s. Calculate the effective equivalent coefficient of permeability of soil deposit in horizontal direction and vertical direction. **07**

Q.4 **(a)** Explain standard proctor test to determine OMC and MDD of a soil in the laboratory. **07**

(b) The max. dry density and optimum moisture content of a soil from standard proctor test are 1.90 gm/cm^3 and 15% respectively. Calculate the water content necessary to completely saturate the sample at its max. dry density, assuming no change in volume. Sp. Gravity G = 2.68 **07**

OR

Q.4 **(a)** What is " shear strength " of soil ?. Explain unconfined compression test in detail. **07**

(b) In a drained consolidated triaxial test, a specimen of clay fails at a cell pressure **07**

of 60 kN/m^2. The effective shear parameters are C = 16 kN/m^2 and $\phi = 22^\circ$. Calculate the deviator stress .

Q.5 **(a)** What is consolidation of soil mass ? Explain procedure for determining pre-consolidation pressure with graph. **07**

(b) A clay soil layer 7m thick is subjected to a pressure of 80 kN/m^2 . If the layer has double drainage and it undergoes 50 % consolidation in one year, calculate the coefficient of consolidation. If coefficient of permeability is 0.08 m/year, determine the settlement in one year. Take $\gamma_w = 9.81$ kN/m^3 . **07**

OR

Q.5 **(a)** Write short note on **07**

(i) Sensitivity of soil (ii) Textural classification of soil

(b) Write short note on **07**

(i) Characteristics of flow net. (ii) Quick sand condition

****