

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER- V • EXAMINATION – WINTER 2016

Subject Code: 150604**Date: 17/11/2016****Subject Name: Geotechnical Engineering-I****Time: 10:30AM – 01:00PM****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)** Explain the terms: Air content, Bulk unit weight, Saturated Unit weight, Void ratio, Degree of Saturation, Moisture content, Specific Gravity **07**
- (b)** (i) Derive the relationship between Void ratio, Degree of saturation, moisture content and Specific gravity. **07**
(ii) A soil sample in its undisturbed state was found to have found to have volume of 105 cm³ and mass of 201 g. After oven drying the mass got reduced to 168g. Compute (i) water content, (ii) void ratio, (iii) porosity (iv) Degree of saturation (v) Air content. take $G = 2.7$
- Q.2 (a)** Sketch Plasticity Chart. Explain unified soil classification system **07**
- (b)** Following results refer to a liquid limit test: **07**
Number of blows: 33 23 18 11
Water content(%): 45.5 49.5 51.5 55.6
Plastic limit is 23.5%. Determine the plasticity Index & toughness index
- OR**
- (b)** A soil sample is found to have the following properties. classify the soil according I. S. classification system: **07**
Passing 75 micron sieve = 10%, Uniformity coefficient = 8, PI = 4
Passing 4.75 mm sieve = 70%, Coefficient of curvature = 2.8
- Q.3 (a)** State Darcy's law. Explain the validity of Darcy's law. State the range of coefficient of permeability in reference to various types of soils. **07**
- (b)** Sketch typical dry density- water content plot from the following results: **07**
Water content(%) 7.7 11.5 14.6 17.5 19.7 21.2
Mass of wet soil(Kg) 1.7 1.89 2.03 1.99 1.96 1.92
Obtain maximum dry density and optimum moisture content. Also draw zero air void line. Take $G = 2.67$, Volume of mould = 945cc.
- OR**
- Q.3 (a)** A cylindrical mould of diameter 7.5 cm contains 15 cm long sample of sand. When water flows through the soil under constant head at a rate of 55cc/minute, the loss of head between two points 8cm apart is found to be 12.5cm. Determine the coefficient of permeability of the soil. **07**
Sketch & explain the principal of constant head set up.
- (b)** What is compaction? How does it differ from Consolidation? Describe briefly the various methods of compaction. **07**
- Q.4 (a)** Enumerate the discrepancies of Direct shear box test. Stating components of direct shear box test, draw the sketch. **07**

- (b) A cylindrical saturated soil sample fails at an axial stress of 167 kN/m^2 in an unconfined compression test. The failure plane makes an angle of 54° with the horizontal. Calculate shear strength parameters. Verify by graphical method. 07

OR

- Q.4 (a) Enumerate the limitations of Direct shear box test. Sketch and explain vane shear test 07
- (b) The following are the results as obtained from direct shear box test on sandy clay sample of area 36 cm^2 . 07

Normal load (N)	Peak(maximum) shear force, N
100	110
200	152
300	193

Plot the graph & obtain the shear strength parameters.

- Q.5 (a) Explain the following terms : Isochrones, Secondary compression, Coefficient of consolidation, Compression Index 07
- (b) Define : **Degree of consolidation** in terms of settlement. 07
- A clay layer whose total settlement under a given loading is expected to be 250 mm in 15 days after the application of a load increment. How many days will be required for it to reach settlement of 125 mm . The layer has double drainage.

OR

- Q.5 (a) Sketch the fixed ring consolidation cell (Oedometer) indicating various components. Explain the term 'consolidation'. 07
- (b) A 1 cm thick laboratory soil sample reaches 60% consolidation in 32.5 seconds under double drainage condition. Find how much time required for a 10 m thick layer in the field to reach the same degree of consolidation if (i) it has drainage face on one side only (ii) it has drainage face two side. 07
