

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (OLD) EXAMINATION – WINTER 2018

Subject Code:150604

Date: 11/12/2018

Subject Name: Geotechnical Engineering - I

Time: 10:30 AM TO 01:00 PM

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) Define the following terms **03**
 1. Void ratio 2. Degree of saturation 3. Air content
- (b) Derive relation between void ratio, degree of saturation, specific gravity and water content **04**
- (c) A soil sample has porosity of 40 %. The specific gravity of solids is 2.70. Calculate (1) Void ratio (2) Dry Density (3) Unit weight if the soil is 50% saturated (4) unit weight if the soil is completely saturated. **07**
- Q.2** (a) Explain Atterberg limits of Soil **07**
 (b) Explain I. S. Classification of Coarse Grain Soil **07**
- OR**
- (b) Explain Aquifer, Aquiclude and Aquifuge **07**
- Q.3** (a) Explain falling head method for finding permeability of soil in laboratory **07**
 (b) Calculate the co-efficient of permeability of a soil sample, 6 cm in height and 50 cm² in cross-sectional area, if a quantity of water 430 ml passed down in 10 minutes, under effective head of 40 cm. On oven drying the test specimen has mass of 498 gm. Taking the specific gravity 2.7, calculate the seepage velocity. **07**
- OR**
- Q.3** (a) List the factors affecting compaction of soil and explain any one in detail. **07**
 (b) A laboratory compaction test on soil having the specific gravity 2.68 gave maximum dry density 1.82 g/cm³ at water content 17%. Determine degree of saturation, air content, and percentage air voids at maximum dry density. What would be theoretical maximum dry density corresponding to zero air voids at optimum water content. **07**
- Q.4** (a) Explain Triaxial test with sketch and different drainage conditions **07**
 (b) A cylinder of soil fails under an axial vertical stress of 160 kN/m², when it is laterally unconfined. The failure plane makes an angle of 50° with the horizontal. Calculate the value of cohesion and the angle of internal friction of the soil **07**
- OR**
- Q.4** (a) Explain Mohor- Coulomb failure theory **07**
 (b) A vane 10 cm long and 8 cm in diameter, was pressed into soft clay at bottom of a bore hole. Torque was applied and gradually increased to 45 N-m when failure took place. Subsequently, the the vane rotated rapidly so as to completely remolded the soil. The remolded soil was sheared at a torque of 18 N-m. Calculate the cohesion of the clay in natural and remolded states and also the value of sensitivity. **07**
- Q.5** (a) Explain piston and spring analogy method for the mechanics of consolidation **07**

- (b) An undisturbed sample of clay 24 mm thick consolidated 50% in 20 minutes, when tested in laboratory with drainage allowed at top and bottom. The clay layer from which sample is obtained is 4 m thick in the field. How much time it would take to consolidate 50% with double drainage? If clay stratum has only single drainage calculates the time to consolidate 50%. Assume uniform distribution of consolidation pressure. **07**

OR

- Q.5 (a) Differentiate between Compaction and Consolidation **07**
(b) A clay layer has a thickness of 5 m and is subjected to a pressure of 60 kN/m^2 . If the layer has double drainage and undergoes 50 % consolidation in one year, determine the coefficient of consolidation taking $T_v = 0.197$. Also if the coefficient of permeability is 0.025 m/year , determine the settlement in one year and rate of flow of water per unit area in one year. **07**

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