

**B.TECH.**  
**(SEM V) THEORY EXAMINATION 2018-19**  
**GEOTECHNICAL ENGINEERING**

Time: 3 Hours

Total Marks: 70

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

- 1. Attempt all questions in brief. 2 x 7 = 14**
- a. Define origin of soil.
  - b. Draw the figure of element separated soil into three phases.
  - c. Compute the range for capillary rise in silt deposits. Assume value of void ratio as 0.7.
  - d. Define Analogy method by Laplace equation.
  - e. What are the preconsolidated stress?
  - f. Define undrained shearing strength.
  - g. What are the Limitations of Coulomb's theory?

**SECTION B**

- 2. Attempt any three of the following: 7 x 3 = 21**
- a. What is the use of particle size distribution curve ? with the help of particle size distribution curve.
  - b. The specific gravity of soil solids for a given soil sample was determined by density bottle method using kerosene . Following observations were recorded. Compute the specific gravity of soil solids at test temperature which was maintained at 27<sup>o</sup>. Also report the value at 4<sup>o</sup> C. Take specific gravity of kerosene at 27<sup>o</sup> C as 0.733.
  - c. Define the terms (i) Quick sand condition (ii) Exit gradient (ii) UU Test
  - d. In the laboratory a 2 cm thick soil sample takes 25 minutes to reach 30% degree of consolidation . Find the time taken for a 5 m thick clay layer in field to reach 40% consolidation . Assume double drainage both cases.
  - e. Using the Rankines theory, the total active thrust on a vertical wall 10 m high , if the soil retained has the following properties  $\Phi=35^{\circ}$   $\gamma=19\text{kN/m}^3$

**SECTION C**

- 3. Attempt any one part of the following: 7 x 1 = 7**
- (a) The plastic limit of a soil is 24% and its plasticity index is 8 % . When the soil is dried from its state of plastic limit , the volume change is 26% of its volume of plastic limit . The corresponding volume change from liquid limit to dry state is 35% of its volume of liquid limit . determine the shrinkage limit and the shrinkage ratio.
  - (b) Define clay minerals. Also discuss Montmorillonite with neat sketches.
- 4. Attempt any one part of the following: 7 x 1 = 7**
- (a) Explain capillary siphoning with neat sketch. And also discuss about partially saturated soil.
  - (b) What are the assumptions and Limitations of Dupuits 's theory.

5. **Attempt any one part of the following:** **7 x 1 = 7**
- (a) Find out the expression for the law of deflection of flow line at the interface of two dissimilar soils.
  - (b) Write the difference between compaction and consolidation. The in situ void ratio of a granular soil deposits is 0.50 . The maximum and minimum soil ratio of the soil were determined to be 0.75 and 0.35.  $G_s=2.67$  also determine the relative density and relative compaction of the deposit.
6. **Attempt any one part of the following:** **7 x 1 = 7**
- (a) In a consolidation test , the void ratio of the specimen which was 1.068 under the effective pressure of  $214 \text{ kN/m}^2$  , changed to 0.994 when the pressure was increased to  $429 \text{ kN/m}^2$  . calculate the coefficient of permeability , compression index . Also find the settlement of foundation resting on above type of clay, if thickness of layer is 8 m and the increase in pressure is  $10 \text{ kN/m}^2$ .
  - (b) A rectangular area  $2\text{m} \times 4\text{m}$  carries a uniform load of  $8 \text{ t/m}^2$  at the ground surface . find the vertical pressure at 5 m below the centre and corner of the loaded area.
7. **Attempt any one part of the following:** **7 x 1 = 7**
- (a) A group of 16 piles of 600 mm diameter is arranged in a square pattern with c/c spacing of 1.2 m. the pilkes are 10 m long and are embedded in soft clay with cohesion of  $30 \text{ kN/m}^2$  . Bearing resistance may be neglected for the piles. Adhesion factor is 0.6. determine ultimate load carrying capacity of the pile group.
  - (b) What are the cased cast-in-situ concrete piles . Explain any two of them with neat sketches.