

(3 Hours)

Total Marks: 80

N.B. : (1) Question No 1 is **compulsory**.

(2) Attempt any **THREE** questions from the remaining questions.

(3) Assumptions made should be clearly stated.

(4) **Figures** to the **right** indicate **full marks**

**Q1. Attempt any FOUR questions**

**20**

- Write a short note on Unit cell concept.
- What are the materials used in reinforced earth structures?
- Explain collapsible soil
- What are the relative merits and demerits of soil densification by compaction piles?
- Explain Sand drains

**Q2. (a) What are the permanent ground improvement techniques? Explain in detail.**

**10**

**Q2. (b) What are the different factors that must be kept in mind for achieving the desired compaction in the field?**

**10**

**Q3. (a) A water tank is to be sited on a soft alluvial deposit of clay. Below the soft clay, there is a thick layer of stiff clay. It is decided that circular embankment with sand drains is inserted into the clay layer to pre-consolidate soil. The height of embankment is 6m and saturated unit weight of the soil is  $18\text{kN/m}^3$ . The thickness of the clay layer is 7m.  $\alpha$  coefficient of volume change is  $0.2\text{m}^2/\text{kN}$ . Coefficient of consolidation in the vertical direction and the radial direction is  $3.5\text{m}^2/\text{year}$  and  $6.2\text{m}^2/\text{year}$  respectively. Diameter of sand drain is 40mm. the desired degree of consolidation is 90% in 6months. Take the spacing as 1.7m in triangular grid arrangement. Design the respective sand drain**

**10**

**Q3. (b) Write a short note on Mononobe and Okabe method**

**10**

**Q4. (a) Calculate the capacity of a horizontal strip anchor situated at a height of 8m below the ground level. The width of the anchor is 2m. The soil being cohesionless having unit weight as  $18\text{kN/m}^3$  and angle internal friction as  $30^\circ$ . The coefficient of acceleration in the horizontal is 0.1 and that of the vertical direction is 0.5times the coefficient of acceleration in the horizontal direction**

**10**

**Q4.(b) Explain Electro-osmosis method for stabilization**

**10**

**Q5.(a)** Sub-soil strata consist of soft silt clay upto 7m depth. In-situ undrained cohesion , i.e.,  $C_u$  is 18kPa and other data are given below-

- Weight density above the ground  $W.T=17.65 \text{ kN/m}^3$
- Effective density (submerged) below the ground water table  $=7.85\text{kN/m}^3$
- Ground water table is situated at 1m below the ground level. on the above of the stone column of water tank is to be supported on earthen pad foundation
- Diameter of the tank= $79\text{m}$
- Load intensity from the tank and the earthen pad is  $147\text{kPa}$
- Diameter of the stone column is  $0.9\text{m}$

Design a stone column foundation system

10

**Q5.(b)** Explain the emerging trends for ground improvement with examples..

10

**Q6.** Attempt any **FOUR**

20

- Explain Free strain condition
- Short note on expansive soil.
- What do you mean by Chemical grouting.
- Explain 3 dimensional consolidations.
- Functions of geosynthetics materials