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Total No. of Pages : 02

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## M.Tech. (Civil) (Soil Mechanics and Foundation Engg) / (Geo Technical Engineering) / (Sem.–1) ADVANCE SOIL MECHANICS Subject Code : CESE-1 M.Code : 37201 Date of Examination : 17-01-23

Time: 3 Hrs.

Max. Marks: 100

## **INSTRUCTION TO CANDIDATES :**

- 1. Attempt any FIVE questions out of EIGHT questions.
- 2. Each question carries TWENTY marks.
- 1. a) What is meant by Base Exchange Capacity? List the cations in order of increasing replacement power. What is the significance of cation exchange?
  - b) Draw the diagrammatic sketch of structure of 'Illite'.
- 2. a) Explain the shape of compaction curve of a cohesive soil in terms of water films around the particles.
  - b) Discuss the factors influencing nature and formation of soils.
- 3. A square footing 3.1 m by 3.1 m carries a uniformly distributed load of 320 kN/m<sup>2</sup>. Determine the intensity of vertical pressure at a depth of 5.1 m below a point 1 m inside each of the two adjacent sides of the footing. Use Boussinesq and Westergaard's analysis and compare the values. Discuss the limitations of both of these methods.
- 4. a) What do you understand by Pre-consolidation pressure? Explain the Casagrade method for determining pre-consolidation pressure. What is its importance to geotechnical engineers?
  - b) Explain about critical state for over consolidated soil.
- 5. An embankment of 10 m height is to be constructed on 7 m thick layer of clay overlying rock. The embankment will increase the mean effective vertical stress in the clay after consolidation from 87kN/m<sup>2</sup> to 197kN/m<sup>2</sup>. The embankment will carry a road which will be laid in 9 months. The surface will be laid one year after the commencement of construction. Assuming that settlement to the extent of 33 mm is allowed after the surfacing of the road, comment on the design of 275 mm diameter sand drains spaced at

2.1 m centre to centre. The sand drains may be arranged in a square pattern. Take coefficient of consolidation in z direction=coefficient of consolidation in radial direction. Assume coefficient of volume change =  $0.35 \text{ m}^2$  /MN.

- 6. a) How is Bishop's rigrous analysis differ from Simplified Bishop's method? Explain in detail.
  - b) Discuss the probable types of failure of a slope.
- 7. a) The idealized variation of cone penetration resistance below a bridge pier foundation is given as under.

layer	z(m)	$qc(kN/m^2)$	$\mathbf{I}^2$
1	1.2	2000	0.375
2	1.2	5000	0:527
3	1.2	5000	.0.527
4	1.7	4000	0.345
5	3.7	8000	0.173

The other details are as under: Plan is  $18 \text{ m} \times 1.5 \text{m}$ .

Depth of the foundation is 2 m.  $\Upsilon = 16.5 \text{ kN/m}^3$ 

Total foundation pressure =  $175 \text{ kN/m}^2$ , t = 12 years

Calculate elastic settlement using strain influence factor.

- b) Explain Skempton-Bjerrum modification for calculation of consolidation settlement.
- 8. Write short notes on the following :
  - a) Isotnorphous Substitution
  - b) Pore pressure coefficients

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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