Reg. No. :

Question Paper Code: 31412

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Fourth Semester

Civil Engineering

01UCE402 – SOIL MECHANICS

(Regulation 2013)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

(Stability charts may be permitted)

PART A - (10 x 2 = 20 Marks)

1. What is shrinkage ratio?

2. Classify the soil with following properties as per BIS

    Passing 75μ sieve =10%
    Passing 4.75mm sieve = 70%
    Uniform Co-efficient = 8
    Co-efficient of curvature = 2.8
    Plasticity index = 4

3. The difference in values of capillary rise for fine sand and silt was found to be 4.5m. If the capillary rise in fine sand is 0.5m, compute the difference in size of voids of the two soils?

4. Express the relation between discharge velocity and seepage velocity.

5. Illustrate the vertical stress distribution on horizontal plane and vertical plane due to point load on soil mass.

6. In a consolidation test void ratio decreased from 0.70 to 0.65 when the load was changed from $50 kN/m^2$ to $100 kN/m^2$. Compute compression index and coefficient of volume change.

7. What is liquefaction?

8. Draw the types of failure of soil specimens in the triaxial compression test.

9. Differentiate between finite and infinite slope.

10. Mention the use of stability number.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Prove the relation $Se = wG$, where S=degree of saturation, e=void ratio, w=water content, G= specific gravity. (8)

      (ii) The following properties were determined for two soils A and B:

	Soil A	Soil B
Water content	37%	25%
Liquid limit	61%	35%
Plastic limit	25%	20%
Specific gravity of soil solids	2.72	2.68
Degree of saturation	100%	100%

      Which of these soils:
        1. contain more clay particles
        2. has a greater saturated unit weight
        3. has a greater dry unit weight
        4. has a greater void ratio
      Answers should be supported by computations. (8)

Or

(b) (i) Discuss the factors affecting compaction of soil? (8)

      (ii) Discuss the field compaction methods and the suitability of compaction equipments for compacting different types of soils? (8)

12. (a) (i) A sand stratum is $10m$ thick. The water table is $2m$ below ground level. The unit weights of sand layer above and below water table are $17 kN/m^3$ and $21\ kN/m^3$. The capillary rise above water table is $1m$. Draw the effective stress, pore pressure and total stress diagrams for the sand stratum. (8)

      (ii) Explain the different types of soil water? (8)

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(b) (i) What are the different field methods to determine the permeability of soil? Discuss briefly their merits and demerits and special applications? (8)

    (ii) Give the applications of flow net. (8)

13. (a) If the maximum vertical stress on a vertical line at radial distance r from the axis of a point load Q is induced at the point of intersection of the vertical line with line drawn from the point of application of load at angle β to the vertical, find angle β to the vertical, using Boussinesq analysis? (16)

Or

(b) (i) A clay layer, whose total settlement under a given load is expected to be 250mm, settles by 50mm in 15 days after the application of a load increment. How many days will be required for it to reach a settlement of 125mm.How much settlement will occur in 300 days? The layer has double drainage. (8)

    (ii) Explain the components of settlement? (8)

14. (a) Explain Mohr-coulomb failure theory. Derive relation between principal stresses at failure and shear strength parameters? (16)

Or

(b) An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 38mm and length 76mm.The load at failure was 30N and the axial deformation of the sample is 11mm.Determine the undrained shear strength parameters, if the failure plane made an angle of 50 with horizontal. (16)

15. (a) Describe the friction circle method of stability analysis for finite slopes? (16)

Or

(b) (i) A canal with a depth of 5m has banks with slope 1:1.The properties of soil are: Cohesion =20kN/m^2, Angle of internal friction (Φ) =15°, e =0.7, G=2.6.Calculate factor of safety with respect to cohesion when (a) canal runs full (b) it is suddenly and completely emptied. (8)

    (ii) Write a note on slope protection measures? (8)

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