R09

B.Tech III Year II Semester (R09) Supplementary Examinations December/January 2014/2015
GEOTECHNICAL ENGINEERING – I
(Civil Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a)   Derive an expression for bulk unit weight in terms of its specific gravity of solids, voids ratio, degree of saturation and unit weight of water.
   b) (The wet density of a glacial deposit is 19.2 kN/m^3. The specific gravity of the soil is 2.67 and the moisture content of the soil is 12% by dry weight. Calculate: (i) Dry density. (ii) Porosity. (iii) Voids ratio. (iv) Air content. (v) Percentage air voids.

2 (a)   Explain preparation of soil suspension for sedimentation analysis.
   (b)   The plastic limit of soil is 30% and its plasticity index is 10%. When the soil is dried from its state to plastic limit, the volume change is 27% of its volume at plastic limit. Similarly, the corresponding volume change from the liquid limit to the dry state is 36% of its volume at liquid limit. Determine the shrinkage limit and the shrinkage ratio.

3 (a)   Define permeability of a soil mass. Explain how you will determine the permeability of a sandy soil sample in the laboratory.
   (b)   Discuss the factors affecting the permeability of soils. State the limitations of Darcy's law.

4 (a)   What is the effect of seepage pressure on the effective stress? Give examples.
   (b)   A 12 m thick layer of relatively impervious saturated clay lies over a gravel aquifer. Piezometer tubes introduced to the gravel layer show an artesian pressure condition with the water level standing in the tubes 3 m above the top surface of the clay stratum. The properties of the clay are e = 1.2, G = 2.7 and γ_{sat} = 19.62 kN/m^3. Determine (i) the effective stress at the top of the gravel stratum layer, and (ii) the depth of excavation that can be made in the clay stratum without bottom heave.

5 (a)   Explain Westergaard's theory for the determination of the vertical stress at a point. How is it different from Boussinesq's solution?
   (b)   What is Newmark's influence chart? Explain its construction and uses.

6 (a)   Explain control of compaction in the field.
   (b)   In a standard Proctor compaction test on a soil the following results were obtained.

Bulk density (Kg/m^3)	2070	2139	2187	2212	2228	2211	2193
Moisture content (%)	6.8	8.5	9.4	10.2	11.3	12.5	13.6

What is the optimum moisture content and maximum dry density? If the specific gravity of solids is 2.65, plot the zero air voids line.

7 (a)   Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi, listing the various assumptions.
   (b)   In a laboratory consolidation test, the void ratio of the sample reduces from 0.85 to 0.73 as the pressure was increased from 1 to 2 kg/cm^2. If the coefficient of permeability of the soil be 3.3 × 10^{-4} cm/sec. Determine: (i) Coefficient of volume change. (ii) Coefficient of consolidation.

8 (a)   Describe in detail the triaxial compression test and how to find out the shear strength parameters.
   (b)   What are the advantages of triaxial test over the direct shear test?
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