Seat
No.

S.E. (Civil) (Semester – I) Examination, 2014
GEOTECHNICAL ENGINEERING
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

Instructions : i) Answer **three** questions from Section – **I** and **three** questions from Section – **II**.

ii) Answers to the **two** Sections should be written in **separate** answer books.

iii) **Neat** diagrams must be drawn **wherever** necessary.

iv) **Use** of logarithmic tables, slide rule, electronic calculator is **allowed**.

v) Assume suitable data, if **necessary**.

SECTION – I

1. a) What are the major soil deposits of India ? Explain any two in brief. 6

   b) Draw a three phase diagram and define degree saturation porosity, air content. 6

   c) Draw particle size distribution curve for Uniformly graded soil and Gap graded soil. 6

   OR

2. a) A shrinkage limit test gave the following observations. Determine the shrinkage limit. Volume of dry pat = 29.30 ml, mass of dry pat = 48.32 gm, initial volume (wet) = 43.50 ml, initial mass (wet) = 66:66 gm, find the shrinkage limit. 6

   b) What is specific gravity of soil ? How it is determined in the Laboratory ? 6

   c) Draw plasticity chart and also explain how fine grained soils are classified with plasticity chart. 6

3. a) Derive the expression for coefficient of permeability for variable head test. 6

   b) State how field permeability is determined. Explain any one method. 6

   c) What is flow net ? What are the properties of flow net ? 4

   OR

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4. a) What are the factors affecting the permeability of a soil ? Explain. 6

   b) In order to compute the seepage loss through the foundation of a coffer dam. How nets were constructed ? The result of the flow net gave. Nf = 5 and Nd = 16. The head loss during seepage was 10.0 m. If the coefficient of permeability of soil K = 4 ×10⁻⁵ m/min. Compute the seepage loss per meter length of dam per day. 6

   c) Define the terms : Gravitational water, held water, structural water and hygroscopic water. 4

5. a) Explain the concept of pressure bulb. What is its significance ? 6

   b) Write a short note on "Proctor needle in field compaction control." 6

   c) How MDD and OMC are determined with standard proctor test ? 4

OR

6. a) Write the equations for stresses in soil for point loading by Boussinesq's and Westergaard's theory and explain the terms involved. 6

   b) A soil sample OMC of 15% and bulk density of 1.84 gm/cc. Determine void ratio, porosity, degree of saturation and maximum dry density. Assume G = 2.7 me G = 2.70. 6

   c) What are the factors affecting compaction of soil ? 4

SECTION – II

7. a) What are the advantages of triaxial compression test in comparison with the direct Shear test ? 6

   b) Draw Mohr's envelope in respect of a c-ϕ soil, and derive relation between major principal stress, minor principal stress, cohesion and the angle of failure plane made with horizontal. 6

   c) A cohesive soil has an angle of shearing resistance of 15^0 and cohesion of 35 KN/m². If a specimen of this soil is subjected to a triaxial compression test, find the value of lateral pressure in the cell for failure to occur at a total axial stress of 300 KN/m². 6

OR

8. a) State the factors affecting shear strength of soil and explain the terms sensitivity and thixotropy. 6

   b) A cylindrical specimen of dry sand was tested in a triaxial test. Failure occurred under a cell pressure of 120 kN/m² and a deviator stress of 400 KN/m²

   i) What was the angle of shearing resistance of the soil ?

   ii) What were the normal and shear stress on the failure plane ?

   iii) What angle did the failure plane make with the major and minorprincipal plane ? 9

   c) Draw a typical Mohr circle for unconfined compression test and explain how you would determine the shear strength parameters from the Mohr circle. 3

9. a) Explain Coulomb's Wedge theory for determination of earth pressure.　6

   b) State the assumption made in Rankine's Earth Pressure theory.　6

   c) What is the critical height of vertical excavation that can be made without any lateral support in a cohesive soil having following properties - $\gamma = 18$ KN/m^2. c $= 14$ KN/m^2 and $\Phi = 12°$.　4

   OR

10. a) What is infinite and finite slopes ? Give examples.　5

    b) Determine the critical height of slope for a vertical excavation in a c-Φ soil.　5

    c) What is stability number ? Explain with examples, how the stability charts are used in the design of slopes.　6

11. a) What are the different modes of failures of rocks, give examples of each ?　8

    b) What are different index properties of rocks ? What is their importance ?　8

    OR

12. Write short notes on **any four** :　16
    i) Shear strength of rocks.
    ii) Insitu stresses in rocks.
    iii) Hardness of rocks.
    iv) Rock permeability.
    v) Ring shear test.