B.Tech. IN CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

June, 2013

BICE-026 : GEO-TECHNICAL ENGINEERING - I

Time : 3 hours   *Maximum Marks : 70*

Note :   *Attempt **any seven** questions.*
Assume missing data if any.

1.   (a)   Derive a relation for the void ratio (e) in   5
terms of specific gravity of soil and water
content for a fully saturated soil.

(b)   Explain the 3 - phase system of a soil with   5
neat diagrams.

2.   A sample of dry soil is coated with a thin layer of   10
paraffin and weighs 465 gm. It displaced 310 cm^3
of water when immersed in it. After the paraffin
is puled off, it is found to weigh 9 gm and its
specific gravity is 0.9. What is the void ratio of
the soil ; if the specific gravity of the particles is
2.60. What is the porosity ?

3.   The values of liquid limit, plastic limit and   10
shrinkage limit of a soil were reported as :

$w_L = 60\%$, $w_P = 30\%$, $w_S = 20\%$

If a sample of this soil at liquid limit has a volume of 40 cm³ and its volume measured at shrinkage limit was 23.5 cm³. Determine the specific gravity of solids. What is shrinkage ratio and volumetric shrinkage.

4. (a) Define Darey's law. Give the assumptions on which it is derived.   **5**

   (b) Explain how you will determine the coefficient of permeability of a fine grained soil using a variable head method.   **5**

5. Find the intensity of vertical pressure and horizontal shear stress at a point 4 m directly below a 20 kN point load acting at a horizontal surface. What will be vertical pressure and shear stress at a point 2 m horizontally away from the axis of loading but at the same depth of 4 m ?   **10**

6. Explain Standard Proctor's compaction test for measuring the optimum moisture content and dry density of a soil.   **10**

7. (a) State the Coulomb's law and explain Mohr - Coulombs theory of failure.   **5**

   (b) What do you understand by critical density and critical void ratio ?   **5**

8. A cylindrical sample of soil, having cohesion of 0.8 kg/cm² and angle of internal friction of 20°, is subjected to a cell pressure of 1.0 kg/cm². Calculate the maximum deviator stress at which the sample will fail and the angle made by the failure plane with the axis of sample. **10**

9. Explain the Swedish circle method of C- φ soil for the stability of slopes. **10**

10. Write short notes on **any two** : 2x5=10
    (a) Atterberg limits and Indices
    (b) Taylor's stability number
    (c) Vane shear test

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