No. of Printed Pages : 5

BICE-026

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

00146

June, 2015

BICE-026 : GEO-TECHNICAL ENGINEERING – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Assume missing data, if any. Use of scientific calculator is permitted.*

1. (a) Distinguish between the following : $2 \times 2\frac{1}{2} = 5$

(i) Liquid Limit and Liquidity Index,

(ii) Density and Relative Density.

(b) A soil has a plastic limit of 25% and a plasticity index of 30. If the natural water content of the soil is 34%, determine the liquidity index and consistency index. 5

2. (a) The discharge of water collected from a constant head permeameter in a period of 15 minutes is 500 ml. The internal diameter of the permeameter is 5 cm and the measured difference in head between two gauging points 15 cm vertically apart is 40 cm. Calculate the coefficient of permeability. 5

(b) Write the factors that affect the permeability of a soil stratum. If K_1, K_2, K_3 are the permeabilities of layers h_1, h_2, h_3 thick, what is its equivalent permeability in the horizontal and vertical direction ? 5

3. (a) Explain the stress distribution in soils for concentrated loads by Boussinesq's equation. 5

(b) What do you understand by "Pressure bulb" ? Illustrate with sketches. 5

4. (a) Explain the Mohr-Coulomb strength envelope. Sketch the stress-strain relationship for dense and loose sand. 5

(b) The stresses at failure of the failure plane in a cohesionless soil mass are :

Shear stress = 4 kN/m^2,

Normal stress = 10 kN/m^2.

Determine the resultant stress on the failure plane, the angle of internal friction of the soil and the angle of inclination of the failure plane to the major principal plane. 5

5. What are the advantages and disadvantages of a triaxial compression test ? Briefly explain how do you conduct the test and compute the shear parameters for the soil from the test data. 10

6. (a) Describe a suitable method of stability analysis of slopes in
   (i) purely saturated cohesive soil,
   (ii) cohesionless soil. 5

   (b) Critically discuss the basic assumptions made in the stability analysis of slopes. 5

7. Write short notes on the following : 2×5=10
   (a) Texture and Structure of Soils
   (b) Soil Formation

8. (a) The following classification tests were performed on a specimen recorded from a borehole from a depth of 20 feet. The test sample is black with a strong odour. Give the group symbol and group nature. 5

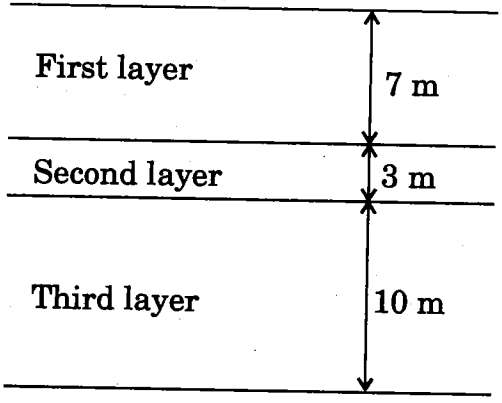
   (b)

Sieve Analysis, % Finer			*Atterberg Limit*	
No. 1	No. 4	No. 200	Liquid Limit	Plastic Limit
100	96	90	80	55

   Define the following :
   (i) Uniformity Coefficient
   (ii) Curvature Coefficient
   (iii) Relative Density [Density Index]
   (iv) Sensitivity
   (v) Activity 5

9. (a) A drainage pipe is clogged with sand whose hydraulic conductivity is found to be 9·0 cm/s. The average difference in headwater and tailwater elevation is 1·2 m and it has been observed that there is a flow of 330 cm^3/s through the pipe. If the pipe is 6 m long and has a cross-section area of 20 cm^2, what length of the pipe is filled with sand ? *5*

(b) A horizontal stratified soil deposit consists of three layers each uniform in itself. The permeabilities of the three layers are 8×10^{-4} cm/s, 52×10^{-4} cm/s, and 6×10^{-4} cm/s and their thicknesses are 7, 3 and 10 m respectively. Find the effective average permeability of the deposit in the horizontal and vertical direction. *5*



10. (a) Define the terms "Compression index", "Coefficient of Consolidation" and "Coefficient of Compressibility" and indicate their units and symbols. *5*

(b) A soil in the borrow pit is at a dry density of 17 kN/m^3 with a moisture content of 10%. The soil is excavated from this pit and compacted in an embankment to dry density of 18 kN/m^3 with a moisture content of 15%. Compute the quantity of soil to be excavated from the borrow pit and the amount of water to be added for 10 m^3 of compacted soil in the embankment. *5*