F 3206   (Pages : 3)   Reg. No...............................

Name...................................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Civil Engineering

GEOTECHNICAL ENGINEERING—I (C)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours   Maximum : 100 Marks

Graph / Semi-log sheets to be supplied.
Missing data if any may be suitably assumed.

Part A

Answer all questions.
Each question carries 4 marks.

1. Define void ratio, specific gravity, dry unit cut, porosity and water content.

2. Define Thixotropy ?

3. What are the limitations of Darcy's law ?

4. Explain quick sand condition.

5. Explain Mohr-Coulomb shear strength theory.

6. Define (i) Total stress ; (ii) Neutral stress ; (iii) Effective stress.

7. State the factors affecting compaction.

8. What do you mean by Taylor's stability charts ?

9. State assumptions of Theezaghi's one-dimensional consolidation.

10. What do you mean by coefficient of consolidation ?

(10 × 4 = 40 marks)

Part B

Answer all questions.
Each full question carries 12 marks.

11. (a) A saturated soil with a volume of 18 ccm weighs 34 g. After oven drying, the soil had a weight
        of 24 g. The dry soil pat displaced 189.04 g. of mercury, when it was immersed in a cup full of
        mercury. Determine the shrinkage limit of the soil and also the shrinkage ratio of the soil.

(7 marks)

    (b) Explain the states of consistency of soil and define the Atterberg limits.   (5 marks)

Or

Turn over

12. (a) Derive the relationship between bulk unit weight, specific gravity, void ratio and degree of saturation.

(5 marks)

(b) A soil sample has following properties : Void ratio = 0.6; Specific gravity = 2.65 ; Water content = 10 %. Determine porosity, dry unit weight, degree of saturation, bulk unit weight and air content.

(7 marks)

13. (a) Briefly discuss the factors affecting coefficient of permeability.   (5 marks)

(b) Calculate the average permeabilities in the horizontal and vertical directions of a soil deposit made of three layers 1.5 m., 1.8 m. and 2.3 m. thick with coefficients of permeabilities of 1×10^{-5} cm./sec., 5×10^{-5} cm./sec.,and 1×10^{-4} cm./sec. respectively.

(7 marks)

Or

14. (a) Explain the procedure of drawing the actual flow net for flow through an anisotropic soil in which the fields are not squares.

(5 marks)

(b) A weir of base width 12 m. is constructed on a permeable soil layer of 12 m. thickness overlying imprevious rock. The base of the weir is horizontal and is 1 m. below the ground surface. The max difference b/w u/s and d/s water levels is 8 m. Draw the flow net. If the coefficient of permeability of the sand layer is 5×10^{-4} cm./sec., compute the seepage loss through the sand layer in m.^{3}/day/m. length of the weir.

(7 marks)

15. (a) Explain Vane shear test. Explain how to find strength of soft clays by Vane shear test.

(5 marks)

(b) Following are the observations of a direct shear test :

Normal stress (σ)		Shear stress at failure (τ)
25	...	60
75	...	80
150	...	105
250	...	145

Estimate shear strength parameters C and ϕ.   (7 marks)

Or

16. (a) How are triaxial tests classified based on drainage conditions ?   (5 marks)

(b) A sample of soil failed in a triaxial test under a deviates stress of 200 kN/m^2, when the confining pressure was 100 kN/m^2. If for the same sample, the confining pressure has been 200 kN/m^2, what would have been the deviates stress ? Assume the soil has $I_C = 0$ and $\phi = 0$ for second case.

(7 marks)

17. (a) Differentiate between Light compaction and Heavy compaction. (5 marks)

(b) A proctor compaction test was conducted on a soil sample, and the fallowing observations were made :

Water content (%) :	8	11.5	14.5	17.5	19.5	21.5
Wt. of wet soil (kg.) :	1.70	1.90	2.00	1.98	1.95	1.92

If the volume of the mould used was 950 CC, and the specific gravity of the soil was 2.65, draw the dry density Vs moisture content curve.

(7 marks)

Or

18. Enumerate the important methods which are generally used for analysing stability of slopes of embankments. Discuss in detail, any one of these methods.

19. (a) Distinguish between :

(i) Primary and secondary consolidation.

(ii) Normally consolidated and over consolidated clays.

(5 marks)

(b) The time required for 50 % consolidation of a 25 mm. thick clay layer drained at top and bottom in the laboratory of 140 seconds. Now long will it take for a 3 m. thick clay layer of the same clay in the field under the same pressure increment to reach 50 % consolidation. In the field there is a rock layer at the bottom of the clay. Also determine the time taken in the field, for 30 % primary consolidation to occur ?

(7 marks)

Or

20. (a) Derive the expression for settlement $S = \dfrac{Cc.H}{(1+e_0)} \log \dfrac{\sigma_0' + \Delta\sigma'}{\sigma_0'}$. (7 marks)

(b) Explain the procedure for determining per consolidation pressure of soil. (5 marks)

[5 × 12 = 60 marks]