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(Pages : 4)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Civil Engineering

CE 010 504—GEOTECHNICAL ENGINEERING—I (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

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 3 marks.

1. Define specific surface of soil.
2. State Darcy's law of permeability.
3. Define the term shear strength of soil.
4. Define zero air void line.
5. Define the term over consolidated soil.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Explain the term Density Index and consistency of soil.
7. Explain the term bulking of sand with neat sketch.
8. Write the advantages of triaxial shear test.
9. Explain the types of finite slope failure.
10. Explain square root of time fitting method of determining coefficient of consolidation.

(5 × 5 = 25 marks)

Part C

Answer all questions.

Each full question carries 12 marks.

11. (a) Define weathering and explain its types.

(6 marks)

Turn over



(b) The following data on consistency limits are available for two soils A and B :



	Soil A	Soil B
Plastic limit	16%	19%
Liquid limit	30%	52%
Flow Index	11	6
Natural water content	32%	40%

Find which soil is :

- (i) More plastic.
- (ii) Better foundation material on remoulding.
- (iii) Better shear strength as a function of water content.
- (iv) Shear strength at plastic limit.

Classify the soil as per ISCS.

(6 marks)

Or

12. (a) The mass specific gravity of a soil equals 1.64. The specific gravity of solids is 2.70. Determine the voids ratio under the assumption that the soil is perfectly dry. What would be the voids ratio, if the sample is assumed to have a water content of 8%.

(6 marks)

(b) Laboratory tests on a soil sample obtained from a foundation site reveal the following data : Total mass of soil sieved is 200g, Cumulative mass retained on 4mm sieve is 30g, Cumulative mass retained on 75 μ sieve is 150g, $D_{10} = 0.07$ mm, $D_{30} = 0.12$ mm, $D_{60} = 1.95$ mm, Liquid Limit = 38%, Plastic Limit = 28%. Classify the soil according to ISCS.

(6 marks)

13. (a) Explain any two methods to determine the coefficient of permeability of soil with neat sketch.

(6 marks)

(b) Explain the term quick sand condition and what will be the critical gradient at which quick sand condition will occur in a coarse grained soil having voids ratio of 0.78 and of specific gravity 2.67.

(6 marks)

Or



14. (a) Explain Darcy's law of permeability. (6 marks)
- (b) In a falling head permeameter test on a silty clay sample, the following results were obtained; sample length 12 mm and diameter 80 mm, initial head 1200 mm, falling head 400 mm, time for fall in head 6 min, stand pipe diameter 4 mm. Find the coefficient of permeability of the soil. (6 marks)
15. (a) Undrained triaxial tests are carried out on four identical specimens of silty clay and following results are obtained

Cell pressure (kN/m ²)	50	100	150	200
Deviator stress at failure (kN/m ²)	350	440	530	610
Pore pressure (kN/m ²)	5	10	120	18

Determine the value of the effective angles of shearing resistance and the cohesion intercept by plotting conventional failure envelope from Mohr circles. (6 marks)

- (b) Explain direct shear test. (6 marks)

Or

16. (a) Explain vane shear test. (6 marks)
- (b) Derive Mohr Coulomb failure theory for soil. (6 marks)
17. (a) Explain how the field compaction is achieved. (6 marks)
- (b) Explain Swedish slip circle method of analysis for C-cohesive soil. (6 marks)

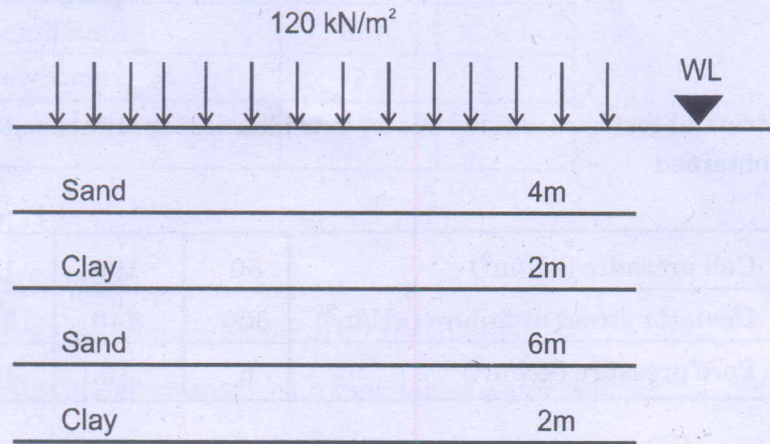
Or

18. (a) Explain the effect of compaction on soil properties. (6 marks)
- (b) Calculate the factor of safety with respect to cohesion of a clay slope laid at 1 in 2 to a height of 10 m, if the angle of internal friction is 10°, $C = 25 \text{ kN/m}^2$ and $\gamma = 19 \text{ kN/m}^2$. What will be the critical height of the slope in this soil? (6 marks)
19. (a) Explain laboratory consolidation test with neat sketch. (6 marks)
- (b) A clay soil layer has a thickness of 5 m and is subjected to a pressure of 60 kN/m². If the layer has a double drainage and undergoes 50% consolidation in one year, determine the coefficient of consolidation taking $T_v = 0.197$. Also if the coefficient of permeability is 0.025 m/year, determine the settlement in one year and rate of flow of water per unit area in one year.

(6 marks)

Turn over

20. (a) Explain the phenomena of secondary consolidation. (4 marks)
- (b) Compute the total settlement for the soil profile as shown in figure.1 having Saturated unit weight of sand $\gamma_{\text{sat}} = 20.8 \text{ kN/m}^3$, $w = 38\%$, $C_c = 0.26$, $G = 2.72$.



(8 marks)

[5 × 12 = 60 marks]

