

D 2384

(Pages : 2)

Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
DECEMBER 2009

CE 04 504—GEOTECHNICAL ENGINEERING—I

(2004 admissions)

Time : Three Hours

Maximum : 100 Marks

Answer all questions.
Assume additional data if required

Part A

- 1 (a) Define void ratio, specific gravity, dry unit weight, porosity and water content.
- (b) Draw and briefly explain Casagrande's plasticity chart.
- (c) Define Darcy's law. Mention its limitations.
- (d) Write short note on Mohr-Coulomb shear strength theory.
- (e) Distinguish between consolidation and compaction.
- (f) Discuss on OMC and zero air voids line.
- (g) Write short note on earth pressure at rest.
- (h) Mention causes of slope failure.

(8 × 5 = 40 marks)

Part B

- 2 (a) (i) Derive relationship between Bulk unit weight, specific gravity, void ratio and degree of saturation. (7 marks)
- (ii) 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 (8 marks)

Or

- (b) (i) Explain oven drying method of determination of water content. (6 marks)
- (ii) Classify the following three types of soils as per Indian standards :

Sl. No.	Gravel size %	Sand size %	Silts and clays size %	Liquid limit %	Plastic limit %	Coefficient of uniformity (Cu)	Coefficient of curvature (Cc)
1	02	97	01	-	-	7	1.5
2	01	03	96	60	25	-	-
3	01	01	98	30	24	-	-

(3 × 3 = 9 marks)

Turn over

3. (a) (i) Briefly discuss on factors affecting coefficient of permeability. (6 marks)
 (ii) A soil sample of height 6 cm and cross-sectional area 100 cm^2 was subjected to falling head permeability test. In a time interval of five minutes, head dropped from 60 cm to 20 cm. If cross-sectional area of stand pipe is 2 cm^2 , compute coefficient of permeability. Derive the formula used.

(9 marks)

Or

- (b) (i) Explain Vane shear test. Explain how to find strength of soft clays by Vane shear test. (8 marks)
 (ii) Following are the observations of a Direct shear test.

Normal stress σ (kN/m ²)	Shear stress at failure τ (kN/m ²)
25	60
75	80
150	105
250	145

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

4. (a) (i) With sketches, discuss on use of proctor needle in field compaction control. (8 marks)
 (ii) Explain modified proctor test. What are its uses? (7 marks)

Or

- (b) (i) With sketches, explain Terzaghi's theory of one dimensional consolidation. (9 marks)
 (ii) The thickness of saturated specimen of clay under a consolidation pressure of 100 kN/m^2 is 22.12 mm and its water content is 14%. On increase of consolidation pressure to 200 kN/m^2 , the specimen thickness decreased by 1.28 mm. Determine compression index of soil. Assume specific gravity of soil solids as 2.70.

(6 marks)

5. (a) (i) Explain Culmann's Graphical method of determination of Active Earth force. (7 marks)
 (ii) A vertical smooth wall 7 m high supports backfill soil having following properties: $C = 0$, $\phi = 30^\circ$, $G = 2.7$, $e = 0.6$. Water table is at a depth of 3m. from top. Above water table, degree of saturation is 40%. At top horizontal backfill surface is subjected to uniform surcharge of 20 kN/m^2 . Draw active earth pressure diagram and find location and magnitude of active earth force.

(8 marks)

Or

- (b) (i) With sketches, explain friction circle method of analysing the slopes. (9 marks)
 (ii) Calculate factor of safety with respect to cohesion, of a clay slope laid at 1 in 2 (26.5°) to a height of 10 m, if the angle of internal friction is 10° , $C = 25 \text{ kN/m}^2$, $\gamma = 19 \text{ kN/m}^3$. What will be the critical height of the slope. Assume Taylor's stability number as 0.064.

(6 marks)

[11 + 10 = 21 marks]