

ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE
B.E. / B.TECH. DEGREE EXAMINATIONS : NOV / DEC 2011

REGULATIONS : 2008

FOURTH SEMESTER - CIVIL ENGINEERING

080100018 - SOIL MECHANICS

Time : 3 Hours

Max. Marks : 100

PART - A

(10 x 2 = 20 Marks)

ANSWER ALL QUESTIONS

1. What are the conditions to be satisfied for a soil classified as well graded and poorly graded gravel
2. Define the term degree of saturation.
3. Define effective stress and Neutral stress.
4. Define cation exchange capacity.
5. What is meant by stress isobar?
6. What are the usual loading intensities released on soil sample when consolidation test is conducted?
7. Draw the stress – strain relationship of rigid plastic and non-linear elastic materials based on Mohr-Coulomb failure theory.
8. List out any two advantages of direct shear tests.
9. What is meant by finite slope?
10. Define Taylor's stability Number

PART - B

(5 x 16 = 80 Marks)

ANSWER ALL QUESTIONS

- 11 (a) What are the Atterberg limits? Write the detailed procedure to conduct the limits

(OR)

- 11 (b) The following data are obtained from Lab test on two soil samples. Classify the sample A and B based on BIS.

Particle size(mm)	% Finer	
	Sample A	Sample B
4.75	100	100
2.00	95	100
0.425	82	48
0.075	75	25
Liquid limit %	48	23
Plastic limit %	24	24

- 12 (a) A sandy soil of average void ratio of 0.7 and specific gravity of solids 2.7 extends for a large depth from the ground level. Find the effective stress at a depth of 5 m when the soil is
 - (i) Saturated
 - (ii) Submerged conditions

(OR)

- (b) A soil sample of height 60 mm and area of cross section of 10000 mm² was subjected to falling head permeability test. In a time interval of 5 minutes, the head dropped from 600 mm to 200 mm. If the cross sectional area of the standpipe is 200 mm², compute the coefficient of permeability of the soil sample. Derive the equation used, if any. If the same sample is subjected to a constant head of 180 mm, calculate the quantity of water collected in one hour after flowing through the sample.

13 (a) An elevated structure is supported on a tower with four legs. The legs rest on piers located at the corners of a square of side 7 m. If the value of vertical stress increment due to this loading (considering 4 equal concentrated loads) is 25 kPa at a point 8 m beneath the centre of the structure, what will be the stress increment at 10 m below any one of the legs?

(OR)

(b) i) Define initial, primary and secondary consolidation. (6)

ii) Discuss the limitations of Terzaghi's theory of consolidation. Why is it used despite its limitations? (10)

14 (a) A series of shear test was performed on a soil. Each test was carried out until the soil sample sheared and the principal stresses for test are as follows:

σ_3 (Minor principal stress) kN/m ²	300	400	500
σ_1 (Major principal stress) kN/m ²	875	1160	1460

Plot the Mohr circle of stress and determine the cohesive strength and angle of internal friction of the soil.

(OR)

(b) Two identical specimens of a soil were tested in a triaxial apparatus. First specimen failed at a deviator stress of 870 kPa when cell pressure was 300 kPa, while the second specimen failed at a diameter stress of 1400 kPa under a cell pressure of 500 kPa. Determine the shear strength parameters. Also, find the deviator stress at failure when the cell pressure was 700 kPa. If the same soil is tested in a direct shear apparatus, estimate the shear stress at which the sample will fail under a normal stress of 800 kPa.

15 (a) i) Explain Slip Circle Method of analysis for C - ϕ soils. (10)

ii) What are the types of slope failures? With neat sketches, illustrate them. (6)

(OR)

(b) Derive an expression for the factor of safety on an infinite slope in a cohesionless soil and hence obtain the Taylor stability number.

*****THE END*****