



Reg. No. :

Question Paper Code : 50270

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fourth Semester

Civil Engineering

CE 6405 – SOIL MECHANICS

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

PART – A

(10×2=20 Marks)

1. Define Liquid limit.
2. List out various factors influencing compaction.
3. Define flow net. Draw a neat sketch.
4. Write the various types of field permeability test.
5. What is the use of consolidation test data ?
6. Find the compression index of remoulded soil sample with liquid limit of 40%.
7. What do you meant by Thixotropy ?
8. Write the advantages of direct shear test.
9. Define finite slope.
10. Write the formula for finding factor of safety with respect to cohesion and friction.

PART – B

(5×13=65 Marks)

11. a) i) A soil mass in its natural state is partially saturated having a water content of 17.5 percent and void ratio of 0.87. Determine the degree of saturation, total unit weight dry unit weight what is the weight of water required to make a mass of 10m³ volume to get saturated assume $G = 2.69$. (10)
- ii) Write the formula for flow index and plasticity index. (3)

(OR)

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- b) 500 gms of dry soil was used for sieve analysis the masses of soil retained on each sieve is given below :

I.S sieve	Mass in gms
2.00 mm	10
1.40 mm	18
1.00 mm	60
500 μ	135
250 μ	145
125 μ	56
75 μ	45

Plot the grain size distribution curve and compute the following :

- a) Percentage of gravel, coarse sand, medium sand, fine sand and silt as per I.S 1498.
- b) Uniformity coefficient
- c) Coefficient of curvature, classify the soil. (13)
12. a) A sand stratum 10m thick. The water table is 2m below ground level. The unit weight of sand layers above and below water table are 17 kN/m^3 and 21 kN/m^3 respectively. The capillary rise above water table is 1 m. Draw the effective stress pore pressure and total stress diagram for the sand stratum. (13)
- (OR)
- b) Briefly explain about the Laboratory methods of permeability test with neat sketch. (13)
13. a) Derive the equation for Terzaghi's theory of one dimensional consolidation with a neat sketch. (13)
- (OR)
- b) Discuss in detail about the Boussineq's analysis to find vertical stress and horizontal shear stress for point load. (13)
14. a) Briefly discuss about the various types of triaxial shear test based in drainage condition. (13)

(OR)



- b) The following table gives data obtained from triaxial compression test conducted under undrained condition on two specimens of same soil sample. The diameter and height are 40mm and 80mm respectively for both samples.

Specimen no	1	2
Cell pressure (KN/m ³)	100	200
Deviator load at failure (N)	637	881
Increase in volume at failure (ml)	1.1	1.5
Axial compression (mm)	5	7

Find C_u and ϕ_u by graphical method. (13)

15. a) Explain the stability analysis of finite slope by friction circle method with suitable sketch. (13)

(OR)

- b) A canal with a depth of 5m has banks with slope 1 : 1 the properties of soil are $C = 20 \text{ kN/M}^2$, $\phi = 15^\circ$, $e = 0.7$, $G = 2.6$. Calculate the factor of safety with respect to cohesion i) when canal runs full and ii) it is suddenly and completely emptied. (13)

PART – C

(1×15=15 Marks)

16. a) A 5 m thick saturated soil stratum has a compression index of 0.25 and coefficient of permeability $3.2 \times 10^{-3} \text{ mm/sec}$. If the void ratio is 1.9m at vertical stress of 0.15 N/mm^2 . Compute the void ratio when the vertical stress is increases to 0.2 N/mm^2 also calculate settlement due to above stress increase and time required for 50% consolidation and 90% consolidation. (15)

(OR)

- b) In vane shear test conducted in a soft clay deposit failure occurred at torque of 42 Nm afterwards. The vane was allowed to rotate rapidly and test was repeated in the remoulded soil. The torque at failure in the remoulded soil was 17 Nm. Calculate the sensitivity of soil. In both cases the vane was pushed completely inside soil. The height of vane and diameter across blades are 100 mm and 80 mm respectively. What will be the change in the above results if top of the vane is not in contact with soil? (15)