

B.E. / B.Tech. (Civil Engineering) Model Curriculum Semester-III
004 / PCC-CE304 - Geotechnical Engineering-I

P. Pages : 2

Time : Three Hours



GUG/W/24/13710

Max. Marks : 80

- Notes :
1. Assume suitable data wherever necessary.
 2. Illustrate your answers wherever necessary with the help of neat sketches.
 3. Discuss the reaction, mechanism wherever necessary.

1. a) Write a note on formation of soil. 6
- b) Define the following term. 4
- i) Void ratio
 - ii) Degree of saturation
 - iii) Porosity
 - iv) Air content
- c) Derive from the basic principle that $\gamma = (G + Se / 1 + e)\gamma_w$. 6

OR

2. a) What are the methods of determining field density of soil. Explain any one method with neat sketch. 8
- b) One cubic meter of wet soil weights 19.8 KN if the specific gravity of soil particles is 2.7. And water content is 11%. Find void ratio, dry density and degree of saturation. 8
3. a) What are Consistency limits of soil and define each limit. 6
- b) The results of sieve analysis of a soil are given below. 10

IS Sieve	20 mm	10 mm	4.75 mm	2 mm	1.0 mm	0.6 mm	4.25 μ	212 μ	150 μ	75 μ	Pan
Mass of soil retained	35	40	80	150	150	140	115	55	35	25	75

Draw the particle size distribution curve and determine uniformity coefficient and coefficient of curvature.

OR

4. a) Differentiate between Consolidation and compaction with suitable example. 8
- b) Differentiate between Standard Proctor Test and Modified Proctor Test. 8
5. a) With a neat sketch explain “Constant Head Permeability test” for determination of Permeability in laboratory. 8

- b) Standard Compaction test was performed on a soil sample and following data was obtained. 8

Water Content (%)	10	12	14.3	16.1	18.2
Wt. Of wet Soil (gm.)	1925	2095	2150	2125	2070

Volume of mould used is 1000cm^3 . Assuming Specific Gravity of Soil Solids as 2.7. Obtain maximum dry density and optimum moisture content. Also plots the zero air void line.

OR

6. a) Derive the relationship for F.O.S. of an infinite slope made of cohesion less soil subjected to Seepage parallel to slope for cohesion less soil. 6

- b) Find the F.O.S. of the slope with following properties. 10

Slope angle = 45°

Height of slope = 10 m

Angle of internal friction = 20°

Unit Weight of soil = 18KN/m^3

Cohesion = 20KN/m^2

The tension cracks are likely to be developed. Consider the effect of tensile crack on F.O.S. Take Direction angle $\alpha_A = 28^\circ$, $\alpha_B = 37^\circ$. Retain all construction line.

7. a) State the assumptions made by Rankine's Earth Pressure Theory. 4

- b) For the vertical retaining wall 8 m high find the safe distance of the footing from the back of wall. 12

The details are given below. Unit weight of soil is 18KN/m^3

Live load on footing is 100KN/m

Angle of internal friction $\phi = 30^\circ$ and angle of wall friction δ is 20° .

OR

8. a) Explain Plate load test with its limitations. 8

- b) Design a strip footing to carry a load of 750KN/m at a depth of 1.6 m in a $C-\phi$ soil 8

having a unit weight of 18KN/m^3 and shear strength parameters as $C = 20\text{KN/m}^2$ and $\phi = 25^\circ$. Determine the width of footing, using a factor of safety of 3 against shear failure. Use Terzaghi equation consider $N_c=25.1$, $N_q=12.7$, $N_r=9.7$.

9. a) Prove that most dangerous plane on which failure of soil take place is having direction 8

$\alpha = 45^\circ + \frac{\phi}{2}$. To the horizontal.

- b) A sample of cohesionless sand in a direct shear test fails under a shear stress of 160KN/m^2 8

when Normal stress is 140KN/m^2 . Find angle of shearing resistance and principal stresses at failure.

OR

10. a) Explain friction circle method stepwise with diagram. 8

- b) Derive the expression for critical height for an infinite slope of $c-\phi$ soil. 8
