

DEPATMENT OF CIVIL

SUB: GEOTECHNICAL

-I

COURSE: B.TECH

YEAR/SEMI: III-II B TECH CIVL (2018-2019)

REGULATION:R16

UNIT: 01 INTRODUCTION

1. a) Draw mineral structures of Clay and explain their behavior in brief.
b) Explain the formation of soils.
2. a) Define the terms (i) void ratio, (ii) water content, (iii) dry density and (iv) degree of Saturation.
b) Define the terms specific gravity of particles, porosity and submerged density.
3. (a) Describe briefly the different types of soil structures.
(b) Explain relative density.
4. Discuss the characteristics and construction of kaolinite, montmorillonite and illite Mineral groups.
5. What is compaction? Factors effecting on compaction. Differentiate compaction and consolidation.

PROBLEMS:

1. Calculate the void ratio, porosity and degree of saturation of a soil sample if it is Having wet density 2.0 g/cc and dry density 1.8 g/cc. specific gravity of soil is 2.7
2. A soil specimen has water content of 10% and a wet unit weight of 20 kN/m³. If the Specific gravity of solids is 2.7, determine the dry unit weight, void ratio and degree of saturation, take unit weight of water is 10 kN/m³.

UNIT-02 INDEX PROPERTIES OF SOILS

1. Write short notes on following
Sensitivity ii) toughness index iii) Thixotropy iv) plasticity index
2. (a) Define Consistency Limits? Why they are required to find in geotechnical

? What are they?

(b) Sieve analysis test is conducted on a soil sample weighing 500 g. The results are Given below.

Sieve size(mm)	20mm	10mm	4.75mm	2mm	1.0mm	0.6mm	425 μ	212 μ	150 μ	75 μ	pan
mass of the soil retained	35	40	80	150	150	140	115	55	35	25	75

Plot the grain size analysis curve and compute C_u and C_c and classify the soil.

3. Explain any one method for determination of liquid limit of a soil.
 - (b) Define the terms (i) flow index, (ii) toughness index, (iii) plasticity index and (iv) Liquidity index.
4. a) What are the uses of consistency limits? What are their limitations?
 (b) Differentiate between dry sieve analysis and wet sieve analysis. Why wet sieve analysis Is required?
5. a) Describe in detail the Indian soil classification system.
 b) Explain any one method for determination of liquid limit of a soil.

UNIT-03 PERMIABILITY

1. (a) How would you determine the average permeability of a soil deposit consisting of Number of layers.
 (b) The falling head permeability test was conducted on soil sample of 4 cm diameter and 18cm length. The head fell from 1m to 0.4m in 20min. If the cross sectional area of the Stand pipe was 1 cm², determine the coefficient of permeability
2. (a) What is Darcy's law? What are its limitations?
 (b) Determine the average horizontal and vertical Permeability's of a soil mass made up
3. of three horizontal strata, each 1m thick, if the coefficients of permeability are 1 x 10⁻¹mm/s, 3 x 10⁻¹mm/s and 8 x 10⁻²mm/s for the three layers.
4. Explain different methods for determination of coefficient of permeability in a laboratory. In a falling head permeameter the sample was 18 cm long and having a cross sectional Area of 22 cm², calculate the time required for drop of head from 25 to 10 cm, if the Cross sectional area of standard pipe was 2 cm². The sample of the soil was Heterogeneous having a permeability of 3x10⁻⁴ cm/sec for first 6 cm, 4x10⁻⁴ cm/sec for Second 6cm and 6x10⁻⁴ cm/sec for the last 6cm thickness. Assume the flow taking Place perpendicular to the bedding planes.
5. Draw the sketch and describe working of falling head Permeability test. Derive the Governing equation for coefficient of permeability.
6. What are the factors that affect permeability?

UNIT-4 STRESS DISTRIBUTION IN SOILS

1. Distinguish between the following
equipotential lines and flow line **ii)** effective stress and neutral stress **iii)** discharge
Velocity and seepage velocity. **v)** Natural water content and optimum moisture content.
2. A concentrate load of 225 kN acts on the surface of a homogeneous soil mass of large
Extent. Find the stress intensity at a depth of 15 m and **(i)** directly under the load,
and
(ii) At a horizontal distance of 7.5 m away from the point of application of the load. Use
Boussinesq's equations.
3. A concentrate load of 300 kN acts on the surface of a homogeneous soil mass of large
Extent. Find the stress intensity at a depth of 2 m and **(i)** directly under the load, and **(ii)**
at a horizontal distance of 3.0m away from the point of application of load. Use
Boussinesq's equations.
4. A line load of 90 kN/m run extends to a long distance. Determine the intensity of
Vertical stress at a point 1.5 m below the surface **(i)** directly under the line load and **(ii)**
at a distance 1 m perpendicular to the line. Use Boussinesq's theory.
5. Explain Westergaard's theory for the determination of the vertical stress at a point.
How is it different from Boussinesq's solution?
6. What do you understand by geostatic stresses? How are these determined?

UNIT: 05 CONSOLIDATIONS

1. a) State the assumptions of Terzaghi's theory of one dimensional consolidation.
b) Discuss the spring analogy for primary consolidation. What are its uses?
2. Define (i) compression index (ii) Coefficient of consolidation (iii) Coefficient of
Volume decrease
3. (a) Differentiate between primary consolidation and secondary consolidation.
(b) Explain why there is a significant time lag in the settlement of clay soils but
Not in sandy soils.
4. (a) What are different causes of pre consolidation in soils? What is the effect of
Pre consolidation on the settlement?
5. (b) How would you determine the time-settlement curve in the field?

UNIT: 06 SHEAR STRENGTH OF SOIL

1. (a) Differentiate between unconsolidated undrained test and drained test. Under what
Conditions are these test results used for design purposes?
2. (a) What is coulombs equation of shear strength of soils? Discuss the factors which
affect The shear strength parameters of clay soil.

- (b) Briefly discuss the effects of drainage conditions on the shear strength parameters of clay soil.
- 3. (a) What is Mohr Circle? Discuss its important characteristics?
b) What are the different tests conducted to measure the shearing strength of soils? Write triaxial compression test briefly and discuss with example sample results.
- 4. (a) What is Coulomb's equation of shear strength of soils? Discuss the factors which affect the shear strength parameters of clay soil.
(b) Briefly discuss the effects of drainage conditions on the shear strength parameters of Clay soil.
- 5. (a) What is Coulomb's equation of shear strength of soils? Discuss the factors which affect the shear strength parameters of clay soil.
(b) Briefly discuss the effects of drainage conditions on the shear strength parameters of Clay soil.

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