UNIT III – STRESS DISTRIBUTION AND SETTLEMENT

PART-A

1. What is immediate settlement?

The settlement which is caused by the elastic deformation of dry soil and of moist and saturated soils without any change in moisture content.

2. What is primary consolidation settlement?

The settlement which results of volume change in the saturated cohesive soils because of expulsion of the water that occupies the voids space.

3. What are the approximate methods of determination of vertical stress under loaded areas?

- Equivalent point load method
- Two to one load distribution method
- Sixty degree distribution

4. What are the reasons for compression of the soil?

- Compression of solid particles & water in the voids.
- Compression & expulsion of air in the voids.
- Expulsion of water in the voids.

5. What are the stages of consolidation?

The stages of consolidation are

- Initial consolidation
- Primary consolidation
- Secondary consolidation

6. What is a principal plane?

At every point in a stressed body, there are three planes on which the shear stresses are Zero. These planes are known as principal planes.

7. What are the limitations of coulomb's theory?

The limitations of columb theory are

- It neglects the effect of the intermediate principal stress.
- It approximates the curved failure envelope by a straight line which may not give correct results.

8. Give the Coulomb's shear strength equation.

The Coulomb's shear strength equation is given by,

S= c + tan

C = cohesion

□ □= Angle of internal friction

9. What is Unconsolidated- Undrained condition?

In this type of test no drainage is permitted during the consolidation stage. The drainage is also permitted in the shear stage.

10. What is consolidated- undrained condition?

In a consolidated- undrained test, the specimen is allowed to consolidate in the first stage. The drainage is permitted until the consolidation is complete.

11. What is the main cause of slope failure?

Slope failures occur when the rupturing force exceeds resisting force.

12. What are the factors affecting permeability tests?

The following five physical characteristics influence the performance and applicability of permeability tests:

(1) Position of the water level,
(2) Type of material - rock or soil,
(3) Depth of the test zone,
(4) Permeability of the test zone, and
(5) Heterogeneity and anisotropy of the test zone.

13. Define effective stress.

Effective stress equals the total stress minus the pore water pressure, or the total force in the soil grains divided by the gross cross-sectional area over which the force acts. Define Critical Depth. If there is no distinct change in the character of subsurface strata within the critical depth, elastic solutions for layered foundations need not be considered.

Critical depth is the depth below the foundation within which soil compression contributes significantly to surface settlements. For fine-grained compressible soils, the critical depth extends to that point where applied stress decreases to 10 percent of effective overburden pressure. In coarse-grained material critical depth extends to that point where applied stress decreases to 20 percent of effective overburden pressure.

14. Write a note on piping.

Piping and Subsurface Erosion. Most piping failures are caused by subsurface erosion in or beneath dams. These failures can occur several operations. In essence, water that comes out of the ground at the toe starts a process of erosion (if the exit gradient is high enough) that culminates in the formation of a tunnel shaped passage (or "pipe") beneath the structure. When
the passage finally works backward to meet the free water, a mixture of soil and water rushes through the passage, undermining the structure and flooding the channel below the dam.

It has been shown that the danger of a piping failure due to subsurface erosion increases with decreasing grain size. Similar subsurface erosion problems can occur in relieved dry-docks, where water is seeping from a free source to a drainage or filter blanket beneath the floor or behind the walls. If the filter fails or is defective and the hydraulic gradients are critical, serious concentrations of flow can result in large voids and eroded channels.

15. Define stress path.

A convenient way to represent test results, and their correspondence with the stresses in the field, is to use a stress path. In this technique the stresses in a point are represented by two (perhaps three) characteristic parameters and they are plotted in a diagram. This diagram is called a stress path.

16. Give the introduction about stresses in soil.

Stresses are induced in a soil mass due to weight of overlaying soil and due to the applied loads. These stresses are required for the stability analysis of the soil mass, the settlement analysis of foundations and the determination of the earth pressures.

17. Write the assumptions made in the Boussinesq theoretical solutions.

- The soil mass is an elastic continuum, having a constant value of modulus of elasticity i.e., he ratio between the stress and strain is constant.
- The soil is homogeneous, i.e., it has identical properties at different points.
- The soil is isotropic, i.e., it has identical properties in all directions.
- The soil mass is semi – infinite.
- The soil is weightless and is free from residual stresses before the application of the load.

18. Write the assumptions made in the Terzaghi's theory of consolidation.

- The soil is homogeneous and isotropic
- The soil is fully saturated.
- The solid particles and water in the voids are incompressible. The consolidation occurs due to expulsion of water from the voids.
- The co efficient of permeability of soil has the same value at all points, and it remains constant during the entire period of consolidation.
- Darcy's law is valid throughout the consolidation process.
- Soil is laterally confined, and the consolidation takes place only in axial direction. Drainage of water occurs only in the vertical direction.
- The time lag in consolidation is due entirely to the low permeability of the soil.
- There is a unique relationship between the void ration and the effective stress and the relationship remains constant during the load increment.

Part B -12 Mark Questions

1. Explain core cutter method of determination of field density.
3. Explain the method of construction of Newark's Influence chart
4. Explain the consolidation test in detail.
5. Explain the laboratory method of consolidation test.
6. Explain the term with a neat sketch immediate and consolidation settlement.
7. Give short notes with neat sketch on pressure distribution diagrams.
8. Explain the method of Terzaghi's one dimensional consolidation theory.
9. Draw the diagram for various cases of drainage face and consolidation pressure distribution systems.