QUESTION BANK

DEPARTMENT: CIVIL **SEMESTER: V**

SUBJECT CODE / Name: 19CEB301 / SOIL MECHANICS

UNIT 3 – STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT

PART – A (2 marks)

1. Illustrate the assumptions made in Boussinesq's analysis
2. Compare normally and over consolidated clay
3. Explain the method of estimating vertical stress using Newmark's influence chart.
4. What are the assumptions made in Terzaghi's one dimensional consolidation theory?
5. What is the use of influence chart in soil mechanics?
6. Differentiate between 'Compaction' and 'Consolidation'.
7. Write down the use of influence charts.
8. What are isochrones?
9. When a soil mass is said to be homogeneous?
10. What are isobars?
11. Differentiate Consolidation and Compaction.
12. List the components of settlement in soil.
13. What are the two theories explaining the stress distribution on soil?
14. What is oedometer?
15. What is geostatic stress and pre-consolidation pressure?
16. What are the applications of Boussinesque equation?
17. What is a pressure bulb and Newmark's Chart?
18. Write the equation for stress in soil due to a uniformly loaded circular area.
19. Write the equation for stress in soil due to a line load.
20. Write the equation for stress in soil beneath a corner of a uniformly loaded rectangular area.
21. Write the Westergaard's equation for stress beneath a concentrated point load.
22. Define co-efficient of compressibility and compression index.
23. What are the methods to determine co-efficient of consolidation?
24. What are the factors influencing consolidation?

PART – B (16 marks)

1. A water tank is supported by a ring foundation having outer diameter of 10 m and inner diameter of 7.5 m. the ring foundation transmits uniform load intensity of 160 kN/m^2. Compute the vertical stress induced at depth of 4 m, below the centre of ring foundation, using
   (i) Boussinesque analysis and
   (ii) Westergaard's analysis, taking $\mu = 0$
2. A stratum of clay with an average liquid limit of 45% is 6m thick. Its surface is located at a depth of 8m below the ground surface. The natural water content of the clay is 40% and the specific gravity is 2.7. Between ground surface and clay, the subsoil consists of fine sand. The water table is located at a depth of 4m below the ground surface. The average submerged unit weight of sand is 10.5 kN/m^3 and unit weight of sand above the water table is 17 kN/m^3. The weight of the building that will be constructed on the sand above clay increases the overburden pressure on the clay by 40 kN/m^2. Estimate the settlements of the building.
3. Estimate the intensity of vertical pressure and horizontal shear stress at point 4m directly below a 20 kN point load acting at a horizontal ground surface what will be vertical pressure and shear stress at a point 2m horizontal away from the axis of loading but at the same depth of 4m.
4. Explain with a neat sketch the Terzhaghi's one dimensional consolidation theory.
5. The load from a continuous footing of width 2m, which may be considered to be strip load of considerable length, is 200 kN/m^2. Determine the maximum principal stress at 1.5m depth below the footing, if the point lies (i) directly below the centre of the footing, (ii) directly below the edge of the footing and (iii) 0.8m away from the edge of the footing.
6. Discuss about the Newmark's influence chart and mention its significance.
7. In a laboratory consolidometer test on a 20 mm thick sample of saturated clay taken from a site, 50% consolidation point was reached in 10 minutes. Estimate the time required for the clay layer of 5 m thickness at the site for 50% compression if there is drainage only towards the top. What is the time required for the clay layer to reach 50% consolidation if the layer has double drainage instead of single drainage.

8. What are the various components of a settlement? How are these estimated?
9. Explain laboratory consolidation test with neat sketch.
10. How will you determine preconsolidation pressure?
11. How will you determine coefficient of compression index (CC) from an oedomoter test?
12. An undrained soil sample 30cm thick got 50% consolidation in 20 minutes with drainage allowed at top and bottom in the laboratory. If the clay layer from which the sample was obtained is 3m thick in field condition, estimate the time it will take to consolidate 50% with double surface drainage and in both cases, consolidation pressure is uniform.
13. Derive Boussinesque equations to find intensity of vertical pressure and tangential stress when a concentrated load is acting on the soil.
14. Explain the assumptions made by Boussinesque in stress distribution on soils.
15. A line load of 100 kN/m run extends to a long distance. Determine the intensity of vertical stress at a point, 2 m below the surface and
    i) Directly under the line load and
    ii) At a distance 2 m perpendicular to the line.
    Use Boussinesq's theory.
16. Explain in detail the laboratory determination of co-efficient of consolidation.
17. A layer of soft clay is 6 m thick and lies under a newly constructed building. The weight of sand overlying the clay layer produces a pressure of 2.6 kg/cm^2 and the new construction increases the pressure by 1.0 kg/cm^2. If the compression index is 0.5. Compute the settlement. Water content is 40% and specific gravity of grains is 2.65