

SAMPLE PRACTICE QUESTIONS

GEOTECHNICAL ENGG.

- 1.Explain with a neat sketch the three phase diagram for soil. Define air content and percentage air voids with the help of phase diagram.
- 2.Derive from the first principle the expression $\gamma_b = ((G+Se)\gamma_w)/(1+e)$.
- 3.Calculate the void ratio and dry density of the soil sample with 25% porosity if the specific gravity is 2.75.
- 4.The insitu density of soil is 16kN/m³. The weight of soil filled in a one litre container in its loosest state and densest state are 15N and 17N respectively. What is the density index of the soil? $G = 2.67$
- 5.The plastic limit and plasticity index of the soil are 13% and 10 respectively. If the natural water content of the soil is 18%. Determine the following.
a) Liquid Limit b) Liquidity Index c) Consistency Index
- 6.Define uniformity coefficient and coefficient of curvature and its importance.
- 7.A partially saturated sample from a borrow pit has a natural water content of 14% and bulk unit weight of 19kN/m³. The specific gravity of solids is 2.70. Determine the void ratio and degree of saturation. What will be the unit weight of the sample on saturation?

8. Define Stoke's law and its limitations.

Classify the soil with justifications; $C_u=7$, $C_c=2$, % Gravel =20%, % Sand =75%.

9. Define i) Effective stress ii) Quick Sand Condition iii) Phreatic Line

10. A 8m thick soil profile consists of 5m depth sand layer above a 3m depth clay layer. The water table is at 3m below the ground level. The sand above water table is 40% saturated. The void ratio of sand layer is 0.6 with a specific gravity of 2.65. The clay layer has a water content of 45% with a specific gravity of 2.70. Draw the Total, neutral and effective stress diagram up to a depth of 8m.

11. What are the advantages of triaxial test over direct shear test?

12. In a drained triaxial test on a dense sand the cell pressure was 150kPa and the deviator stress to cause failure was 540kPa. Calculate the angle of internal friction. Also find the angle made by the failure plane with respect to the major principal plane.

13. A sample in a variable head permeameter is 100mm in diameter and 120mm high. The permeability of the sample estimated to be 10-3mm/s. If it is desired that the head in the stand pipe should fall from 250mm to 100mm in 180s, determine the size of the stand pipe to be used.

14. What are the assumptions in Terzaghi's one dimensional consolidation theory
In a laboratory consolidometer test on a 20mm thick sample of saturated clay

taken from a site, 50% of the consolidation was reached in 10 minutes. Estimate the time required for the clay layer of 5m thickness at the site for 50% compression if the bottom is impervious. Assume that the laboratory sample and the clay sample at the site are both subject to the same increase in stress. How much time will take the clay layer to reach 90% consolidation? What is the time required for the clay layer to reach 50% consolidation if the clay has double drainage? (represent the time in years)

15. Define i) primary consolidation settlement ii) secondary consolidation settlement iii) Degree of consolidation.

16. Define i) Relative compaction ii) zero air void line iii) optimum moisture Content

17. A cohesive soil yields a MDD of 1.8g/cc at an OMC of 16% during standard proctor test. If the value of G is 2.65, What is the degree of saturation? What is the maximum dry density to which it can be further compacted to?

A certain clay layer has a thickness of 5m. After one year when the clay was 50% consolidated 8cm of settlement had occurred. For a similar clay and loading conditions how much settlement would occur at the end of one year and 4 years, if the thickness of this new layer is 25m?