

## CE8491 SOIL MECHANICS

### Important 13 Mark Questions

#### Part-B

1. Explain Indian Standard soil classification system.
2. A sample of clay was coated with paraffin wax and its mass, including the mass of wax, was found to be 697.5 g. The sample was immersed in water and the volume of the water displaced was found to be 355 ml. The mass of the sample without wax was 690 g, and the water content of the representative specimen was 18%. Calculate the bulk density, dry density, void ratio and the degree of saturation. The specific gravity of the solids was 2.7 and that of the wax was 0.89.
3. Explain the engineering behaviour of compacted cohesive soils.
4. A soil mass in its natural state is partially saturated having a water content of 17.5 percent and void ratio of 0.87. Find the degree of saturation, total unit weight, dry unit weight what is the weight of water required to make a mass of  $10 \text{ m}^3$  volume to get saturated assume  $G = 2.69$ .
5. For a homogeneous earth dam of 52 m height and 2 m free board, the flow net has 22 potential drops and 5 flow channels. Find discharge per meter length of the dam, given  $k = 22 \times 10^{-6} \text{ m/sec}$ , and exit hydraulic gradient.
6. Describe the Unconfined Pumping Out Flow and determine the coefficient of permeability of soil. Also explain Draw Down Curve.
7. Explain in detail with neat sketches, the laboratory determination of permeability methods.
8. A constant head permeability test was conducted on a sandy soil of 160mm in length, cross sectional area is  $6000 \text{ mm}^2$  and porosity is 40% under a constant head of 300mm. Discharge was found out to be  $45 \times 10^3 \text{ mm}^3$  in 18 seconds. Calculate the coefficient of permeability, discharge velocity and seepage velocity. List out the four methods of obtaining flow net.
9. Explain Taylor's square root time method for determining coefficient of consolidation.
10. A concentrated load of 22.5 kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 3m, 6m, 9m, 12m, and 15m directly below the point load; sketch the vertical stress distribution diagram along vertical axis.

11. A direct shear test was performed on 60 mm x 60 mm sample of dry sand. The normal load was 360 N. The failure occurred at a shear load of 180 N. Plot the Mohr strength envelope and determine  $\phi$ . Assume  $c = 0$ . Also, Identify the principal stresses at failure.
12. An unconfined compression test was carried out on a sample of clay had a diameter of 38 mm and a length of 76 mm. The load at failure measured by the proving ring was 45 N and the axial deformation of the sample at failure was 15 mm. Calculate the unconfined compressive strength, undrained shear strength and undrained cohesion of the clay sample.
13. Write the detail about Mohr's coulomb theory
14. How do you find the shear strength of soil using Vane Shear test and derive the formula used to calculate the shear strength? Invent where this test is mostly used?
15. Build the equation for Terzaghi's theory of one-dimensional consolidation with a neat sketch.
16. A rectangular foundation, 3 x 2.1 m is perfectly flexible and carries a load of 300kN/m<sup>2</sup>. Find the vertical pressure at a depth of 5 m below a point P at center and corner.
17. Develop points on differences between finite and infinite slope.
18. An infinite slope made of soil with  $c' = 20$  kPa,  $\phi = 20^\circ$ ,  $e = 0.65$  and  $G=2.7$  is 10m high. The slope angle is  $25^\circ$ . Find the factor of safety with respect to height for the following conditions. a) When the soil is dry, b) When the slope is submerged.
19. Build up points on FOS of a finite slope possessing both cohesion and friction ( $c - \phi$ ) by method of slices.
20. A  $45^\circ$  slope has been excavated to a depth of 8 m in a saturated clay, which has following properties;  $C_u = 60$  kN/m<sup>2</sup>,  $\phi_u = 0$ ; and unit weight = 20 kN/m<sup>3</sup>. Determine the factor of safety for the trial failure surface whose radius is 12 m and arc length is 18.84 m. The area of the trial wedge is 70 m<sup>2</sup> and centre of gravity of the trail wedge is 4.5 m away from the centre of the failure surface.
21. Analyze the stability of soil using friction circle method with neat sketch.
22. An infinite sandy soil slope has a saturated unit weight of  $\gamma_{sat}=19.5$ kN/m<sup>3</sup> and angle of internal friction  $\phi = 35^\circ$ .The minimum factor of safety needed for the slope against is 1.3. Estimate the safe angle of slope. A) When the slope is dry without seepage. B) If seepage occurs at and parallel to surface of the slope.
23. Briefly explain about the method of analysis of finite slopes.
24. What is meant by Geosynthesis? How are they classified? What are the advantages & applications? A cut 9 m deep is to be made in clay with a unit weight of 18 kN/m<sup>3</sup>

SSLC, HSE, DIPLOMA, B.E/B.TECH, M.E/M.TECH, MBA, MCA

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and cohesion of  $27 \text{ kN/m}^2$ . A hard Stratum exists at a depth of 18 m below the ground surface. Determine from Taylor's charts if a 30° slope is Safe. If a factor of safety of 1.50 is desired, examine the safe angle of slope?