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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Civil Engg.) III Year I-Semester (Main) Examinations, Nov./Dec.-2016

Soil Mechanics

Time: 3 hours Max. Marks: 70

*Note: Answer ALL questions in **Part-A** and any FIVE from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Differentiate between Specific Gravity of solids and mass Specific Gravity.
2. The in-situ void ratio of a soil mass is found to be 0.80. If its maximum and minimum void ratios are 1.10 and 0.50 respectively, determine the relative density of the soil at site.
3. Between clay and sand which is more porous and which is more permeable?
4. What is the critical hydraulic gradient for a soil having specific gravity G = 2.7 and void ratio e = 0.70?
5. Define over consolidation ratio. What is its maximum value?
6. The primary consolidation settlement of a 6m thick clay layer with single drainage is estimated as 90cm. Later it was found that, the medium has double drainage. Then, all other parameters remaining same, what will be the primary consolidation settlement?
7. The unconfined compressive strength of a soil is 100kPa. Determine its shear strength.
8. Explain the significance of shear strength in soils.
9. Explain in brief about Taylor's stability number.
10. Determine the depth of tension crack developed in a $\phi = 0$ soil having cohesion c = 35kPa and $\gamma = 18kN/m^3$.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) Explain the laboratory procedure for determination of shrinkage limit and derive the expression for it.

    b) In a field exploration, a sample was collected in a sampling tube of internal diameter 5cm below ground water table. The length of the extracted sample was 10.2cm and its weight was 387gm. If G = 2.7, and the weight of the dried sample is 313gm, find the porosity, void ratio, degree of saturation and the dry density of the sample.

12. a) Explain the procedure to draw the phreatic line for a homogeneous earth dam with a horizontal filter using Kozeny's parabola.

    b) The water table is located at a depth of 3m below the ground surface in a deposit of sand 11m thick. The sand is saturated above the water table. The total unit weight of sand is $20kN/m^3$. Calculate the total pressure, pore water pressure, effective pressure at depths of 3, 7 and 11m from the ground surface and draw the pressure distribution diagram.

13. a) What is Terzaghi's one dimensional consolidation theory? Derive it from fundamentals.

    b) A soil stratum is 10m thick with pervious stratum at top and bottom. Determine the time required for 50% consolidation. Given that coefficient of permeability as 10^{-7} cm/sec, coefficient of compression as $3x10^{-4}$ cm^2/gm, void ratio as 2 and time factor as 0.197.

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14. a) What is Mohr's circle? Discuss its important characteristics.

    b) In a direct shear test, a cohesionless soil sample was failed at a shear stress of 45kPa under a normal stress of 60kPa. Sketch the Mohr's circle and determine *i)* The shear parameters *ii)* The principal stress *iii)* The orientation of the principal planes.

15. a) What are different types of slope failures? Explain in detail.

    b) A 9m high retaining wall with a vertical face is supporting a backfill with horizontal top consisting of two types of soils. The water table is located at a depth of 5m below the top. The properties of soil from 0 to 3m include $c = 0$, $\phi = 33°$, $\gamma = 17kN/m^3$ and those for soil from 3m to 9m include $c = 0$, $\phi = 40°$, $\gamma = 18.5kN/m^3$, $\gamma_{sub} = 20.5kN/m^3$. Plot the distribution of passive earth pressure and determine the magnitude and point of application of total passive earth pressure acting on the retaining wall.

16. a) Explain the methods to determine in-situ density.

    b) An unconfined aquifer is known to be 32m thick below the water table. A constant discharge of $2m^3/min$ is pumped out of the aquifer through a tube well till the water level in the tube well become steady. Two observation wells at distances of 15m and 70m from the tube well show fall of 3m and 0.7m respectively from their static water levels. Find the permeability of the aquifer.

17. Write short notes on any ***two*** of the following:
    a) Plate load test
    b) Factors affecting shear strength of cohesive soils
    c) Coulomb's wedge theory.