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## VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
### B.E. (Civil Engg.) III Year I-Semester Main & Backlog Examinations, December-2017
### 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. Write the representative heights of capillary rise (m) in different types of soils.

2. Differentiate between Specific Gravity of solids and mass Specific Gravity.

3. What is quick sand condition?

4. How would you determine average permeability of soil deposit consisting of number of layers?

5. Define Coefficient of volume change and Compression Index

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. Explain Mohr-Coulomb failure criterion.

8. The unconfined compressive strength of a soil is 100kPa. Determine its shear strength.

9. Write the variation of coefficient of earth pressure with the movement of the wall.

10. Explain the term 'Depth of tension crack' in cohesive backfills.

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

11. a) Differentiate between a residual soils and transported soils. Briefly define the characteristics of various common soils found in general use.

   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) An earth dam is built on an impervious foundation with a horizontal filter near the toe. The permeability of the soil in horizontal and vertical directions is $3 \times 10^{-2}$ mm/s and $1 \times 10^{-2}$ mm/s respectively. The full reservoir level is 30 metres above the base. A flownet constructed for the section of the dam consists of 4 flow channels and 16 head drops. Estimate the seepage loss per metre length of the dam.

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

   b) A 6m thick fully saturated compressible clay medium with an average initial effective overburden pressure of 90 kpa is undergoing consolidation process due to an increment of 60Kps. Determine the total primary consolidation settlement if eo = *1.10, PL = 36%, PI* = 44.

14. a) Explain the Triaxial shear test and state its merits and demerits.

    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 1) The shear parameters 2) The principal stress 3) The orientation of the principal planes.

15. a) Explain "Swedish slip circle" method and derive expression for factor of safety of stability of a clay slope.

    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 IS soil classification including the plasticity chart.

    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. Answer any *two* of the following:

    a) e-logP curves

    b) Factors affecting shear strength of cohesive soils

    c) Coulomb's wedge theory

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