KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2020 Admission
IV Semester Final Examination – August 2022

Lwre.2205 **Soil Mechanics (2+1)** **Marks: 50**
Time: 2 hours

I **Fill in the blanks** **(10x1=10)**

1. The ratio of void volume to total volume is .....
2. Liquid limit is the boundary between.....and .....
3. Modified Proctor test was standardised by .....
4. Pycnometer is used to determine .....
5. A soil is said to be non-plastic when its plasticity index is equal to .....
6. For coarse grained soils ..... permeability test is used.

State True or False

7. The rate at which the consolidation occurs in a soil is directly related to the permebility .
8. Permeability is directly proportional to the unit weight of water and inversely proportional to viscosity.
9. The friction circle method assumes the failure surface as the arc of a circle.
10. A clay having flocculant structure has a high void ratio.

II **Write short notes on ANY FIVE of the following** **(5x2=10)**

1. Derive the relation between γ_{sat} , G and e.
2. What are the limitations of sedimentation analysis?
3. Find the average horizontal permeability of a soil mass made of three horizontal layers. The first and second layers have the same thickness of 0.5 metre each. The third layer is of one metre thick. The co efficient of permeability of the first, second and third layers are respectively $1X\ 10^{-3}$ cm/sec., $2X\ 10^{-2}$ cm/sec and $5X\ 10^{-4}$ cm/sec.
4. Coefficient of compressibility and coefficient of consolidation
5. What is a strength envelop? Draw the Coulomb envelope and Mohr's envelope.
6. State the assumptions of Coulomb Wedge theory.
7. Explain the calcium carbide method of determining water content.

III **Answer ANY FIVE of the following** **(5x4=20)**

1. With neat sketches, explain the constant head and falling head permeability tests.
2. The oven dry mass of a pat of clay is 10.8g and the mass of mercury displaced on immersion is 84.2 g. Taking specific gravity of solids as 2.72, determine the shrinkage limit and shrinkage ratio.
3. Derive the equation for total active earth pressure for the case backfill with uniform surcharge. How the height of fill equivalent to the uniform surcharge is determined?
4. Explain the corrections to the hydrometer readings.
5. Clay layer 3.6 m thick is sandwiched between layers of sand. Calculate the time the clay layer will take to reach 50% consolidation. The co efficient of consolidation, found by laboratory tests is $4\ X\ 10^{-4}$ cm/sec.

6. Derive the equation for torque at failure of a vane shear test.
7. A cylinder of soil fails under an axial vertical stress of 160 kN/m^2, when it is laterally unconfined. The failure plane makes an angle of 50^0 with horizontal. Calculate the value of cohesion and angle of internal friction of the soil.

IV **Write an essay on ANY ONE of the following** **(1x10=10)**

1. A retaining wall, 4 m high supports a backfill($c = 20\ kN/m^2$; $\emptyset = 30^0$; $\gamma = 20\ kN/m^3$) with horizontal top, flush with the top of the wall. The backfill carries a surcharge of $20\ kN/m^2$. If the wall is pushed towards the backfill, compute the total passive pressure on the wall, and it's point of application.
2. (i) Explain the Standard Proctor test.
   (ii) What is zero air voids line?
   (iii) How the water content and dry density of field compacted soil is determined?

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