KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2024 Admission
III Semester Final Examination – January 2026

SWC 2103   Soil Mechanics (1+1)   Marks: 50
Time: 2 hours

I   **Fill in the blanks**   (10x1=10)
1. When the natural state of a cohesion less soil is in its densest form, relative density will be ……..
2. The ratio of plasticity index to flow index is called ……………..
3. For any applied stress, zone of influence refers to isobar corresponding to…………..
4. Free water is also known as ………….. water.
5. The neutral stress is equal to …………of total stress and effective stress.
6. For a perfectly dry sample, degree of saturation is ……………
7. The graph between liquid limit and plasticity index is called ………… chart.
8. In shear box test, failure plane is …………… plane.
9. D_{10} is called …………. Size.
10. An isobar is a line joining points of equal vertical ……………

II   **Write short notes on ANY FIVE of the following**   (5x2=10)
1. The porosity of a soil sample is 36% and the specific gravity of its particles is 2.7. Calculate its void ratio and saturated unit weight.
2. Explain any method to determine the moisture content of soil.
3. Draw the Coulomb Envelopes for pure sand and pure clay.
4. An embankment is inclined at an angle of 37 degree and its height is 15 m. The angle of shearing resistance is 15 degree. Find mobilized cohesion if Taylor's stability number is 0.06 and unit weight of soil is 18 kN/m³.
5. Write assumptions on which Mohr's Strength Theory is based?
6. Write expression for determining shear strength of a soil sample using Vane Shear Test.
7. Differentiate between compaction and consolidation.

III   **Answer ANY FIVE of the following**   (5x4=20)
1. A soil has a liquid limit of 27 % and a flow index of 12.5 %. If the plastic limit is 17 %, determine the plasticity index and toughness index. If the water content of the soil in its natural condition in the field is 20%, determine relative consistency.
2. A concentrated load of 2500 kg acts on the surface of a homogenous soil mass of large extent. Find the stress intensity at a depth of 15 m at a horizontal distance of 7.5 m away from the axis of loading. Use Bousssinesq's Analysis.
3. Explain the construction of Newmark's Chart with an influence value of 0.02.
4. Describe the effect of permeability and shear strength on compaction of soil properties.
5. Differentiate between Active Earth Pressure and Passive Earth Pressure.
6. Calculate the active earth pressure per m² and total active pressure per meter length of a retaining wall (having ground surface level) at a depth of 3 m in a uniform sand fill with a unit weight of 20 kN/m³ with an angle of internal friction of 35 degrees.
7. Write assumptions on which Terzaghi's Theory of 1-Dimensional Consolidation is based.

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

1. (a) What are the limitations of Direct Shear Test?
    (b) In a tri-axial shear test conducted on a soil sample having cohesion of 12 kN/m^2 and angle of shearing resistance of 36 degree, the soil pressure was 200 kN/m^2. Determine the value of deviator stress at failure.

2. (a) Describe a method to determine coefficient of consolidation.
    (b) An undisturbed sample of clay stratum 4 m thick was tested in the laboratory and the average value of coefficient of consolidation was 2×10^{-4} cm^2/sec. For a structure built on this stratum, assuming double drainage, how much time will it take to attain half the ultimate settlement?

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