



KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agri. Engg.) 2023 & Previous Admissions
IV Semester Final Examination – June 2025

Lwre.2205

Soil Mechanics (2+1)

Marks: 50
Time: 2 hours

I

Choose the correct answer

(10x1=10)

1. Compaction of an unsaturated soil causes
 - (a) Decrease in bulk density
 - (b) Increase in total volume
 - (c) Reduction in air filled porosity
 - (d) Increase in total soil porosity
2. The plane of shear failure is predetermined in Test.
 - (a) Triaxial shear test
 - (b) Direct shear test
 - (c) Unconfined shear test
 - (d) Polyaxial shear test
3. Mohr's stress circle depends upon stress system.
 - (a) One dimensional
 - (b) Two dimensional
 - (c) Three dimensional
 - (d) None of above
4. If consistency index of soil is equal to unity, it is at
 - (a) Liquid limit
 - (b) Semi-solid state
 - (c) Shrinkage limit
 - (d) Plastic limit
5. When void vector $n_a = 0$, the voids line is called as
 - (a) Maximum air-voids line
 - (b) Minimum air-voids line
 - (c) Air-voids line
 - (d) Zero-air voids line

Match the following

	Group A		Group B
6.	Void volume/Total volume	A	Uniform sphere packing
7.	Void volume/solid volume	B	Drainable porosity
8.	Granular	C	Porosity
9.	Cubical	D	Void ratio
10.	Gravitational Water	E	Soil structure

II

Write short notes on ANY FIVE of the following

(5x2=10)

1. How Modified proctor test is different from Standard proctor test?
2. Explain consistency of soils and its various limits
3. What do you mean by "capillary rise of water in soil"? When this condition occurs in soil?
4. Differentiate between compaction and consolidation.
5. How do you determine void ratio of a soil?

6. What are the effects of compaction on soil properties?
7. State Darcy's law with its equation.

III

Answer ANY FIVE of the following

(5x4=20)

1. 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° with horizontal. Calculate the value of cohesion and angle of internal friction of the soil.
2. What are triaxial tests on cohesionless soil? Give its advantages and disadvantages?
3. Discuss about Mohr coulomb failure theory and effective stress principle.
4. Define the angle of shearing resistance of a soil and explain why this is not always the same as the angle of internal friction.
5. What is cone penetrometer method? How do you measure liquid limit of soil with this method?
6. Describe briefly the vane shear test.
7. Define effective stress and comment on its importance in practical soil mechanics problems.

IV

Write an essay on ANY ONE of the following

(1x10=10)

1. Describe a method of determining the in-situ density of a soil. The in-situ density of a soil sample was found to be 2.10 Mg/m^3 and its water content was 15%. The specific gravity of the particles was 2.71. Calculate the dry density, the void ratio and the degree of saturation. What would be the water content of this soil if completely saturated at the same void ratio?
2. (a) Describe with a neat sketch the constant head permeameter and assuming Darcy's law, derive an expression for the coefficient of permeability.
(b) Calculate the coefficient of permeability of a sample of sand given the following data:

Diameter of permeameter	:	75 mm
Loss of head on a 200 mm length:		83.2 mm
Water collected in 1 min	:	66.8 ml
