

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025***Third Semester**Agricultural Engineering***AI3301 - Principles of Soil Science and Engineering***Regulations - 2021***Duration : 3 Hrs****Maximum : 100 Marks****PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)**

Q.No	Questions	BLT	CO	Marks
1.	What are the properties of montmorillonite mineral?	L1	1	2
2.	Sketch the influence of temperature of soil property and its behavior.	L1	1	2
3.	List major types of soil in Tamil Nadu.	L2	2	2
4.	Enlist the methods of soil reclamation.	L2	2	2
5.	What are the Atterberg's limits? List its types.	L1	3	2
6.	Difference between modified and standard compaction test.	L2	3	2
7.	When is vane shear test adopted? Write the expressions to determine the shear strength of soil.	L1	4	2
8.	Draw the typical stress-strain curve for specimens failed by brittle failure and plastic failure.	L2	4	2
9.	Define local shear failure and General shear failure.	L2	5	2
10.	Write the expression for FOS for friction.	L1	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No	Questions	BLT	CO	Marks
11.	a Derive the equation to derive specific gravity using pycnometer method. What are the other methods to determine specific gravity? Or	L2	1	16
	b List the clay minerals and its uses. Brief the chemical composition of the clay minerals its arrangement and its effect on reaction with water.	L2	1	16
12.	a Develop the method of classification of soil which is helpful for agricultural purpose. Or	L2	2	16
	b i Explain how a survey report helps in identifying plant nutrient.	L2	2	8
	ii List the problematic soil and the remedial process for it.	L2	2	8

13. a A sample of clay was coated with paraffin wax and its mass, including the mass of wax, was found to be 697.5 g. The sample was immersed in water and the volume of the water displaced was found to be 355 ml. The mass of the sample without wax was 690 g, and the water content of the representative specimen was 18%. Determine the bulk density, dry density, void ratio and the degree of saturation. The specific gravity of the solids was 2.7 and that of the wax was 0.89.

Or

- b Test on a soil sample from a borrow area resulted specific gravity of 2.7, void ratio = 0.65 and water content of 15%. What is the quantity of soil required to construct an embankment volume of 8000 m^3 , if the borrow materials compacted to achieve maximum dry density of 18 kN/m^3 at a moisture content 18%. Calculate addition quantity of water required for every cubic meter of compacted soil.
14. a An embankment consists of clay fill for which $c' = 25 \text{ kN/m}^2$ and $\phi' = 27^\circ$ (from consolidated undrained tests with pore-pressure measurement). The average bulk unit weight of the fill is 20 kN/m^3 . Estimate the shear-strength of the material on a horizontal plane at a point 20 m below the surface to the embankment, if the pore pressure at this point is 180 kN/m^2 as shown by a piezometer

Or

- b Explain in detail with neat sketches, the laboratory determination of permeability methods.
15. a A square footing located at a depth of 1.5 m below the ground surface in Cohesionless soil carries a column load of 1280 kN. The soil is submerged having an effective unit weight of 11.5 kN/m^3 and an angle of shearing resistance of 30° . Show and find the size of the footing for $F_s = 3$ by Terzaghi's theory of general shear failure.

Or

- b An infinite slope made of soil with $c' = 20 \text{ kPa}$, $\phi = 20^\circ$, $e = 0.65$ and $G = 2.7$ is 10m high. The slope angle is 25° . Find the factor of safety with respect to height for the following conditions a. When the soil is dry b. When the slope is submerged.