

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025***Fourth Semester**Civil Engineering***CE3404 - Soil Mechanics***Regulations - 2021**Duration : 3 Hrs**Maximum : 100 Marks***PART - A (ANSWER ALL QUESTIONS) (Marks 10*2=20)**

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	Describe the phase diagram for a completely dry and fully saturated soil mass.	L1	1	2
2.	Identify the factors that influence soil compaction.	L1	1	2
3.	Discuss how different factors impact hydraulic conductivity.	L2	2	2
4.	List some common uses of flow nets in engineering.	L1	2	2
5.	Outline the principle underlying Newmark's influence chart.	L2	3	2
6.	Explain how immediate settlement differs from consolidation settlement.	L2	3	2
7.	Define the failure envelopes observed in saturated clay under undrained and drained shear tests.	L1	4	2
8.	What is meant by soil liquefaction?	L1	4	2
9.	Name the various modes of slope failure.	L1	5	2
10.	Summarize the main measures used for slope protection.	L2	5	2

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

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a i Describe the procedure for the pycnometer test to determine the specific gravity of soil.	L2	1	10
	ii A soil sample has a porosity of 40%. The specific gravity of solids is 2.70. Calculate the following: (a) Void ratio, (b) Dry density, (c) Unit weight when the soil is 50% saturated, and (d) Unit weight when the soil is fully saturated.	L3	1	6
	Or			
	b i Discuss the various factors that affect the compaction of soils.	L2	1	10
	ii A 10 m thick bed of sand is underlain by a layer of clay of 6 m thickness. The water table which was originally at the ground surface is lowered by drainage to a depth of 4 m, whereupon the degree of saturation above the lowered water table reduces to 20%. Determine the increase in the magnitude of the vertical effective pressure at the middle of the clay layer due to lowering of water table. The saturated unit weights of sand and clay are respectively 20.6 kN/m ³ and 17.6 kN/m ³ , and the dry unit weight of sand is 16.7 kN/m ³ .	L3	1	6

12. a i Analyze the factors affecting permeability in soils. Discuss how each factor influences the movement of water through soil materials. L4 2 10
- ii Explain the falling head permeability test used to determine the permeability of soil. L2 2 6
- Or
- b i For a homogeneous earth dam 52 m high and 2 m free board, a flow net was constructed and following results were obtained:
Number of equipotential drops = 25
Number of flow channels = 4
The dam has a horizontal filter of 40 m length at its downstream end. Calculate the discharge per meter length of the dam if the coefficient of permeability of the dam material is 3×10^{-3} cm/sec L4 2 10
- ii Describe the assumptions made in the Laplace equation for flow. L2 2 6
13. a Calculate the intensity of vertical pressure and horizontal shear stress at a point 4 m directly below a 20 kN point load acting on a horizontal ground surface. Also, determine the vertical pressure and shear stress at a point 2 m horizontally away from the axis of loading at the same depth of 4 m. Use Boussinesq's equation. L4 3 16
- Take:
- | | |
|-------|--------|
| r/z | K_B |
| 0 | 0.4775 |
| 0.5 | 0.2733 |
- Or
- b i An undisturbed sample of clay, 24 mm thick, consolidated 50% in 20 minutes when tested in the laboratory with drainage allowed at the top and bottom. Given that the clay layer from which the sample was obtained is 4 m thick, calculate the time it will take to consolidate 50% with double drainage. Also, determine the time required for 50% consolidation if the clay stratum has only single drainage. Assume uniform distribution of consolidation pressure. Analyze how the drainage conditions affect the consolidation time. L4 3 10
- ii Analyze the assumptions made in Terzaghi's One-Dimensional Consolidation theory. L4 3 6
14. a Describe the laboratory procedure for conducting a Triaxial Compression Test including a simple sketch of the setup. L3 4 16
- Or
- b i 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 the horizontal. Calculate the value of cohesion and the angle of internal friction of the soil. L3 4 10
- ii Explain the significance of the Vane Shear Test in determining soil strength with neat sketch. L3 4 6

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|-----|---|---|----|---|----|
| 15. | a | Calculate the factor of safety with respect to cohesion, for a clay slope laid at 1 in 2 to a height of 10 m, if the angle of internal friction (Φ) = 10° ; cohesion (c) = 25 kN/m ² and unit weight (γ) = 19 kN/m ³ . What will be the critical height of the slope in this soil? | L3 | 5 | 16 |
| | | Or | | | |
| | b | A slope is 12 m high and has an inclination of 30° . If the soil of the slope has cohesion (c) = 25 kN/m ² , an angle of internal friction (Φ) = 12° , and unit weight (γ) = 18.6 kN/m ³ , determine the factor of safety with respect to shear strength. | L3 | 5 | 16 |