



R22 Regulation

Subject code: 4E6AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VI Semester Regular Examinations, May 2025

SOIL MECHANICS

(CE)

Maximum Marks: 60

Date: 16.06.2025

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Define Porosity and Voids Ratio.	1M	CO1	L1
b)	What is Darcy's Law?	1M	CO1	L1
c)	What is Bearing Capacity of Soil?	1M	CO2	L1
d)	What is optimum Moisture content?	1M	CO2	L1
e)	Write the Atterberg's Limits.	1M	CO3	L2
f)	Write about quick sand condition.	1M	CO3	L2
g)	Define primary consolidation and secondary consolidation.	1M	CO4	L1
h)	What is pressure bulb?	1M	CO4	L1
i)	What is difference between submerged density and saturated density?	1M	CO5	L1
j)	Define Mohr's Strength theory.	1M	CO5	L2

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	
2(a)	An undisturbed sample of soil has a volume 100 cm ³ & mass 200 g on oven drying for 24 hrs, the mass is reduced to 170 g. If G=2.68, determine void ratio, water content & degree of saturation.	5M	CO1	L3
(b)	Explain briefly the various clay minerals.	5M	CO2	L2
OR				
3(a)	Derive the relationship between bulk density, degree of saturation and void ratio of a soil.	5M	CO2	L4
(b)	A dry soil has a void ratio of 0.65 and its grain specific gravity is = 2.80. What is its unit weight? Water is added to the sample so that its degree of saturation is 60% without any change in void ratio. Determine the water content and unit weight. The sample is next placed below water.	5M	CO2	L3
4(a)	What is meant by consistency of soils? Define all the Atterberg limits the following data refer to a sample of soil: Percent passing 4.75 mm IS Sieve = 64 Percent passing 75-μ IS Sieve = 6, Uniformity Coefficient = 7.5, Coefficient of Curvature = 2.7, Plasticity index = 2.5% Classify the soil as per IS soil classification.	5M	CO2	L4

(b)	Explain in detail the procedure for Sieve analysis and discuss how you can plot grain size distribution curve from sieve analysis.	5M	CO2	L2																
OR																				
5(a)	Explain the procedure to conduct the hydrometer test on a soil sample in the lab.	5M	CO2	L3																
(b)	A uniform soil deposit has a void ratio 0.60 and specific gravity of 2.65. The natural ground water is at 2.50 m below natural ground level. Due to capillary moisture, the average degree of saturation above ground water table is 50%. Determine the neutral pressure; total pressure and effective pressure at a depth of 6.0 m. Draw a neat sketch.	5M	CO3	L4																
6(a)	Compare and contrast Boussinesq's and Westergaard's theories.	5M	CO3	L4																
(b)	A strip load of considerable length and 1.50 m width transmits a pressure of 150 kN/m ² to the underlying soil. Determine the maximum vertical stress at 0.75 m depth below the footing, if the point lies (i) directly below the centre of the footing, and (ii) directly below the edge of the footing.	5M	CO3	L3																
OR																				
7(a)	With a sketch explain the construction of a Newmark's chart.	5M	CO3	L2																
(b)	A soil profile consists of a surface layer of sand 3m thick ($\gamma=16\text{kN/m}^3$), an intermediate clay layer 2m thick ($\gamma_{\text{sat}}=19.25\text{kN/m}^3$), and a bottom layer of gravel 4m thick ($\gamma_{\text{sat}}=19\text{kN/m}^3$). The water table is at the top of the clay layer. Determine the effective stress at various interfaces.	5M	CO3	L3																
8(a)	Explain the Spring Analogy concept of consolidation, with neat sketches.	5M	CO3	L2																
(b)	The void ratio of clay A decreased from 0.572 to 0.505 under a change in pressure from 1.20 kPa to 1.80 kPa. The void ratio of clay B decreased from 0.612 to 0.597 under the same increment of pressure. The thickness of sample A was 1.50 times that of B. Nevertheless the time required for 50% consolidation was three times longer for sample B than for sample A. What is the ratio of the coefficient of permeability of A to that of B?	5M	CO3	L4																
OR																				
9(a)	A long strip footing of width 2m transmits a pressure of 200kPa to the underlying soil. Using 2: 1 dispersion method, compute the approximate value of the vertical stress at a depth of 5m below the footing.	5M	CO3	L3																
(b)	Explain the methods to determine coefficient of consolidation.	5M	CO3	L2																
10(a)	Explain the three standard triaxial shear tests with respect to drainage conditions.	5M	CO4	L2																
(b)	The following data relate to a triaxial compression tests performed on a soil sample: Determine the effective shear strength parameters of the soil, graphically only.	5M	CO4	L4																
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Test No.</th> <th style="text-align: center;">Chamber pressure (kPa)</th> <th style="text-align: center;">Maximum deviator stress (kPa)</th> <th style="text-align: center;">Pore pressure at maximum deviator stress (kPa)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td style="text-align: center;">80</td> <td style="text-align: center;">175</td> <td style="text-align: center;">45</td> </tr> <tr> <td style="text-align: center;">2.</td> <td style="text-align: center;">150</td> <td style="text-align: center;">240</td> <td style="text-align: center;">50</td> </tr> <tr> <td style="text-align: center;">3.</td> <td style="text-align: center;">210</td> <td style="text-align: center;">300</td> <td style="text-align: center;">60</td> </tr> </tbody> </table>				Test No.	Chamber pressure (kPa)	Maximum deviator stress (kPa)	Pore pressure at maximum deviator stress (kPa)	1.	80	175	45	2.	150	240	50	3.	210	300	60
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1.	80				175	45														
2.	150	240	50																	
3.	210	300	60																	
OR																				
11(a)	Explain in detail about unconfined compression test.	5M	CO2	L2																
(b)	Write a note on the laboratory Vane shear test.	5M	CO4	L2																