



R22 Regulation

Subject code:4E6AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, November 2025

SOIL MECHANICS

(CE)

Maximum Marks: 60

Date:19.11.2025

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) | A soil has void ratio of 0.65 and specific gravity 2.80. Determine unit weight of dry soil. | 1M | 1 | BL3 |
| b) | Classify different types of soils. | 1M | 1 | BL1 |
| c) | State Darcy's law. | 1M | 2 | BL1 |
| d) | Give the various uses of Flow net in Engineering practices. | 1M | 2 | BL1 |
| e) | List various field compaction equipments along with its suitability. | 1M | 3 | BL1 |
| f) | Mention the assumptions made in Boussinesq's analysis of stress distribution. | 1M | 3 | BL2 |
| g) | Define coefficient of consolidation and compression index. | 1M | 4 | BL1 |
| h) | State the factors influencing settlement. | 1M | 4 | BL2 |
| i) | What causes dilatancy? | 1M | 5 | BL1 |
| j) | Compare the shear strength and bearing capacity of soil. | 1M | 5 | BL2 |

Part-B

| Answer All the following questions. (5X10M=50Marks) | | Marks | CO | Bloom Tx |
|---|---|----------|----|----------|
| 2 | a) Write about formation of soils. b) A compacted cylindrical specimen 50 mm diameter and 100 mm long is to be prepared from dry soil. If the specimen is required to have a water content of 15% and the percentage of air voids is 20, Calculate the weight of soil and water required in the preparation of soil, where specific gravity = 2.69. | 3M 7M | 1 | BL4 |
| OR | | | | |
| 3 | Describe the primary index properties of soil. | 10M | 1 | BL3 |
| 4 | a) Describe in detail with neat sketches, the field determination of permeability. b) The falling head permeability test was conducted on a soil sample of 4 cm diameter and 18 cm length. The head fell from 1.0 m to 0.40 m in 20 minutes. If the cross-sectional area of the stand pipe was 1cm ² , determine the coefficient of permeability. | 5M 5M | 2 | BL4 |
| OR | | | | |

| | | | | |
|----|---|----------|---|-----|
| 5 | Find the value of the effective stress at 2 m, 4 m, 6 m, 8 m and 10 m in a soil mass having unit weight of 21 KN/m ³ . Water table is 2 m below ground surface. Above water table there is capillary rise up to ground surface. Also draw total stress diagram up to 10.00 m unit weight of water is 10 KN/m ³ . | 10M | 2 | BL4 |
| 6 | a) Discuss the effect of compaction on various engineering properties of soils. b) State whether the following statement is true or false and justify your answer: 'The efficiency of compaction improves with increase in compactive effort'. | 7M 3M | 3 | BL3 |
| OR | | | | |
| 7 | A concentrated point load of 200 kN acts at the ground surface. Find the intensity of vertical pressure at a depth of 10 m below the ground surface and situated on the axis of the loading. What will be the vertical pressure at a point at a depth of 5 m and at a radial distance of 2 m from the axis of loading? Use Boussinesq analysis. | 10M | 3 | BL4 |
| 8 | A 5 m thick saturated soil stratum has a compression index of 0.25 and coefficient of permeability 3.2 x10 ⁻³ mm/sec. If the void ratio is 1.9 at vertical stress of 0.15 N/mm ² . Compute the void ratio when the vertical stress is increases to 0.2 N/mm ² . Also estimate the settlement due to above stress increase and time required for 50% consolidation and 90% consolidation. | 10M | 4 | BL4 |
| OR | | | | |
| 9 | Derive the equation for Terzaghi's theory of one dimensional consolidation with a neat sketch and discuss the Limitations of Terzaghi's theory of consolidation. | 10M | 4 | BL5 |
| 10 | A direct shear test was performed on 60 mm x 60 mm sample of dry sand. The normal load was 360 N. The failure occurred at a shear load of 180 N. Plot the Mohr strength envelope and determine ϕ . Assume $c = 0$. Also, Identify the principal stresses at failure. | 10M | 5 | BL4 |
| OR | | | | |
| 11 | Describe the Vane Shear test in detail and classify and compare the methods adopted in this test based on the location of testing and submersion level. | 10M | 5 | BL3 |