



R20 Regulation

Subject code: 3P5AD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Regular Examinations, January 2023

SOIL MECHANICS

(Civil Engineering)

Maximum Marks: 70

Date: 18.01.2023 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 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

(10x2M=20 Marks)

- 1 Define the following terms:
i) Porosity ii) Dry density iii) submerged unit weight iv) Air content
- 2 Define the following terms:
i) Shrinkage ratio ii) Plasticity Index iii) Flow Index iv) Consistency Index
- 3 What are the factors affecting permeability?
- 4 Define Flow net and write its uses.
- 5 Define stress isobar.
- 6 What do you understand by 'Pressure bulb'?
- 7 A structure is erected on an impervious clay whose thickness is 12 m. Drainage is possible both at upper and lower surfaces, coefficient of consolidation is 0.015 cm^2 per minute. For attaining 50% consolidation with a time factor 0.20, the number of days required is?
- 8 Define the following terms:
i) Coefficient of compressibility ii) Compression Index
- 9 Define dilatancy.
- 10 Define Liquefaction.

Part-B

Answer All the following questions.

(10MX 5=50Marks)

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- A. 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. Determine the true unit weight (not considering buoyancy) if the degree of saturation is 95% and 100% respectively. [5M]
- B. Explain about transported soils and soil formation. [5M]

OR

- 12 A. Write a short note on Hydrometer method and mention its corrections. [4M]
 B. In order to determine the water content 370 gm of a wet sandy sample was placed in a pycnometer. The mass of the pycnometer, sand and water full to the top of the conical cap was found to be 2148gm. The mass of pycnometer full of clean water was 1932gm taking $G=2.65$. Determine the water content of the sample. [6M]

- 13 A. Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of three layers of thickness 6 m, 1 m, 3 m and having the coefficients of permeability of 3×10^{-2} mm/sec, 3×10^{-5} mm/sec, 4×10^{-2} mm/sec, respectively. Assume the layers are isotropic [6M]
 B. Discuss briefly about falling head permeability test. [4M]

OR

- 14 A. Define Flownet. Write the characteristics and uses of flownet. [5M]
 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. There is a surcharge of 50kN/m^2 on the ground surface. [5M]
- 15 A. A reinforced concrete water tank of size $6\text{ m} \times 6\text{ m}$ and resting on ground surface carries a uniformly distributed load of 150 kN/m^2 . Estimate the maximum vertical pressure at a depth of 12 m vertically below the centre of the base. [6M]
 B. Write the difference between Boussinesq's and Westergaards theories. [4M]

OR

- 16 A. Write a brief note on the compaction in the field with the various types of rollers and their effectiveness with respect to different soil types. [5M]
 B. Explain briefly factors affecting compaction of soil. [5M]
- 17 A. Describe log time fitting method. [4M]
 B. There is a layer of soft clay 5 m thick under a newly constructed building. The overburden pressure over the centre of the clay layer is 300 kN/m^2 . Compute the settlement, if there is an increase in pressure due to construction of 100 kN/m^2 . Take $C_c = 0.50$, $G = 2.70$. The water content of the deposit was found to be 50 %. [6M]

OR

- 18 A. A Saturated soil stratum 6 meters thick lies above an impervious stratum and below a pervious stratum. It has compression index of 0.28 and a coefficient of permeability of 3.5×10^{-4} cm/sec. Its void ratio at stress of 150 kN/m^2 is 1.95. Determine
 i) The change in void ratio due to increase in stress to 210 kN/m^2
 ii) Settlement of the soil stratum due to the above increase in stress and
 iii) Time required for 50 percent consolidation?
 Assume time factor T for 50 percent consolidation as 0.20 [5M]
 B. Discuss Terzaghi's theory of consolidation by stating the various assumptions and its validity. [5M]

- 19 A. Describe the direct shear test. What are its merits and demerits compared to Triaxial test. [5M]
B. In an unconfined compression test, a sample of 7.5 cm. long and 3.5 cm in diameter fails under a load of 90N at 10% strain. Compute the unconfined compressive strength and shear strength of the sample. [5M]

OR

- 20 A. Write briefly about Mohr's coulomb failure theory. [4M]
B. A granular soil is subjected to a minor principal stress of 200 kN/m^2 . If the angle of internal friction is 30° , determine the inclination of the plane of failure with respect to the direction of the major principal stress. What are the stresses on the plane of failure and the maximum shear stress induced? [6M]