



Regulation R18

Subject Code: 2P4AE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, June 2022

SOIL MECHANICS

(CE)

Maximum Marks: 70

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.
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 void ratio and porosity.
- 2 Define Shrinkage Ratio.
- 3 What is a flow net?
- 4 Define effective stress.
- 5 What are the assumptions of Boussinesq's theory?
- 6 Define isobar.
- 7 What is primary consolidation?
- 8 Define coefficient of volume change.
- 9 What are different types of triaxial compression tests based on drainage conditions?
- 10 What is critical void ratio?

Part-B

Answer All the following questions.

(5x10M = 50 Marks)

- 11 In a compaction test on a soil, the mass of wet soil when compacted in the mould was 1.855 kg. the water content of the soil was 16%. If the volume of the mould was 0.945 liters, determine the dry density, void ratio, degree of saturation and percentage air voids. Take $G = 2.68$. [10]

OR

- 12 a) Show that the degree of saturation can be expressed as [5+5]

$$Sr = \frac{w}{\frac{\gamma_w}{\gamma} (1 + w) - \frac{1}{G}}$$

- b) Prove that the water content (w) of a partially saturated soil can be expressed as

$$w = \frac{1 - (G_m/G)}{(G_m/S) - 1}$$

Where G_m = mass specific gravity, G = specific gravity of solids and S = degree of saturation.

- 13 A soil profile consists of a surface layer of clay 4m thick ($\gamma = 19.5 \text{ kN/m}^3$) and a sand layer 2 m thick ($\gamma = 18.5 \text{ kN/m}^3$) overlying an impermeable rock. The water table is at the ground surface. If the water level in the stand pipe driven into the sand layer rises 2m above the ground surface, draw the plot showing variation of total stress, porewater pressure and effective stress. Take $\gamma_w = 10 \text{ kN/m}^3$. Determine the increase in effective stress at the top of the rock when the artesian head in the sand is reduced by 1m. [10]

OR

- 14 What are the factors affecting permeability of soils, explain? [10]

15 What is the effect of compaction on the engineering properties of the soil? How would you decide whether the soil should be compacted the dry of optimum or the wet of optimum? [10]

OR

16 Discuss the basis of the construction of Newmark's influence chart. How is it used? [10]

17 What are the methods for the determination of coefficient of consolidation? Explain square-root of time method in brief? [10]

OR

18 What is primary consolidation? Discuss the spring analogy for primary consolidation. What are its uses? [10]

19 The stresses on a failure plane in a drained test on a cohesionless soil are as under: [10]

Normal stress (σ) = 100 kN/m²

Shear stress (τ) = 40 kN/m²

a) Determine the angle of shearing resistance and the angle which the failure plane makes with the major principal plane.

b) Find the major and minor principal stresses.

OR

20 Explain in detail the determination of shear strength using direct shear test. [10]