QP Code: R264A013 | Reg. No | | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Fourth Semester – Regular/Supplementary) Examinations, April 2026

23BCVPC24002 - Geotechnical Engineering - I

(Civil Engineering)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Explain the concept of void ratio and porosity. How are they related?	CO1	K2
b. Describe Darcy's law and state the conditions under which it is valid.	CO2	K2
c. What is the total stress in soil? How does it differ from pore water pressure?	CO3	K2
d. Compare field compaction methods with laboratory compaction tests.	CO4	K2
e. What is cohesion in soils? How does it influence shear strength?	CO5	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain the procedure to determine liquid limit and plastic limit of soil.	5	CO1	K2
b. A soil sample has a bulk unit weight of 19 kN/m³ and specific gravity = 2.70. Determine void ratio and degree of saturation if water content = 15%.	5	CO1	K3
(OR)			
c. Compare textural classification and particle size classification of soils**.**	5	CO1	K2
d. Write short notes on soil fabric and flocculated & dispersed structures	5	CO1	K2
3.a. Explain Darcy's law and derive the expression for the coefficient of permeability.	5	CO2	K2
b. In a constant head test: Length = 12 cm, Area = 60 cm², Head difference = 30 cm, Discharge = 600 cm³ in 2 minutes. Determine the coefficient of permeability**.**	5	CO2	K3
(OR)			
c. Explain the use of flow nets in seepage analysis.	5	CO2	K2
d. Discuss the effect of soil structure on permeability.	5	CO2	K2
4.a. What is a critical hydraulic gradient? Explain its engineering significance	5	CO3	K2
b. Calculate total stress, pore water pressure, and effective stress at 8 m depth. Water table at 2 m, γ = 17 kN/m³ (above WT), γ_{sat} = 21 kN/m³ (below WT).	5	CO3	K3
(OR)			
c. Explain the importance of effective stress in soil strength and deformation.	5	CO3	K2
d. Define uplift pressure and explain its effect on soil stability.	5	CO3	K2
5.a. Describe the mechanism of one-dimensional consolidation of clay soils	5	CO4	K2
b. What are the factors affecting compaction? Explain their influence on soil properties.	5	CO4	K2
(OR)			

c.	Explain the compaction curve and how maximum dry density is obtained.	5	CO4	K2
d.	A clay layer with a thickness of 5 m has a compression index of 0.25. Stress increases from 150 kPa to 350 kPa. Calculate settlement.	5	CO4	K3
6.a.	Explain the factors affecting the shear strength of soils.	5	CO5	K2
b.	Compare drained and undrained shear strength conditions.	5	CO5	K2
	(OR)			
c.	Explain Mohr-Coulomb failure theory for soils	5	CO5	K2
d.	Discuss the shear behavior of cohesionless soils and overconsolidated clays	5	CO5	K2

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