PAPER ID-310116

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2024-25
GEOTECHNICAL ENGINEERING

TIME: 3 HRS **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 07 = 14**

Q no.	Question	CO	Level
a.	List the three main phases of soil composition?	1	K1
b.	Define flocculated and dispersed soil structures.	1	K1
c.	State Darcy's Law and explain the significance of hydraulic conductivity.	2	K1
d.	Write two measures to control seepage in earth dams.	2	K1
e.	State the assumptions of Terzaghi's one-dimensional consolidation theory.	3	K1
f.	Differentiate between direct shear test and a triaxial shear test.	4	K2
g.	State the difference between active and passive earth pressure.	5	K1

SECTION B

2. Attempt any *three* of the following: **07 x 3 = 07**

Q no.	Question	CO	Level
a.	Explain the significance of Atterberg limits (liquid limit, plastic limit, and shrinkage limit) in soil mechanics. How are they determined, and how do they help classify soils?	1	K2
b.	A soil sample is partially saturated with a degree of saturation of 80%. The unit weight of the soil is 18 kN/m^3 above the water table and 20 kN/m^3 below. Calculate the effective stress at a depth of 4 m, given that the water table is 2 m below the surface.	2	K3
c.	Explain Proctor needle method and discuss its significance in quality control of soil compaction.	3	K2
d.	Describe the Mohr-Coulomb failure criterion in detail.	4	K2
e.	Discuss Coulomb's theory of earth pressure and derive the expression for active earth pressure considering wall friction. How does it differ from Rankine's theory?	5	K2

SECTION C

3. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Classify the structural and engineering behavior differences among kaolinite, illite, and montmorillonite. Why is montmorillonite more problematic in civil engineering applications?	1	K3

PAPER ID-310116

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2024-25
GEOTECHNICAL ENGINEERING

TIME: 3 HRS **M.MARKS: 70**

b.	A soil sample has a porosity of 40% and is fully saturated. The specific gravity of soil solids is 2.65. Calculate the saturated unit weight and submerged unit weight.	1	K3

4. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Explain the concept of total stress, effective stress, and neutral stress in soils. Discuss their interrelationships and their significance in geotechnical engineering design.	2	K2
b.	Describe critical hydraulic gradient. Derive the expression for the critical hydraulic gradient .	2	K2

5. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	A clay layer 6m thick is subjected to a uniform pressure of 40kPa. The coefficient of consolidation (Cv) is 5×10^{-4} cm^2/s , and drainage occurs on both sides. Calculate the time required for 50% consolidation.	3	K3
b.	Illustrate the difference between primary consolidation and secondary consolidation. Discuss the physical processes governing each and the time scales over which they occur.	3	K3

6. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Examine the mechanisms leading to liquefaction and the factors influencing it.	4	K3
b.	A point load of 200kN acts on a horizontal soil surface. Calculate the vertical stress at a depth of z=3m and at a radial distance r=4m from the point of application. Use Boussinesq's equation.	4	K3

7. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Derive an expression for active earth pressure for a cohesive-frictional soil (c-ϕ) using Rankine's theory.	5	K3
b.	Illustrate the steps involved in drawing the pressure distribution diagram for a retaining wall using Coulomb's graphical method.	5	K3