Q. Code:591842

Reg. No. | | | | | | | | | | | | | |

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2024

Third Semester

CE22301 – SOIL MECHANICS

(Civil Engineering)

(Regulation 2022)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering problems	**3**
CO 2	Describe the basic understanding of flow through soil medium and its impact of engineering solution	**3**
CO 3	Describe the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation	**3**
CO 4	Estimate the shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory	**3**
CO 5	Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications.	**3**

PART- A(20x2=40Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What is meant by “Plasticity Index” and “Flow Index”?	**1**	**2**
2.	Differentiate “Liquid Limit” and “Plastic Limit”.	**1**	**2**
3.	What is meant by “Zero Air Void Line”?	**1**	**2**
4.	List the different types of field compaction techniques.	**1**	**2**
5.	What are the different types of water in between the soil particles?	**2**	**2**
6.	What is meant by “Effective stress” and “Pore water pressure”?	**2**	**2**
7.	State Darcy’s law. Highlight its assumptions.	**2**	**2**
8.	What is meant by “Aquifer and Seepage”?	**2**	**2**
9.	List the different types of loads acting on the soil surface.	**3**	**2**
10.	What are the different components of settlement?	**3**	**2**
11.	What is meant by “Coefficient of volume change”?	**3**	**2**
12.	What is meant by “Compression Index”?	**3**	**2**
13.	List the different types of soil based on shear strength parameters.	**4**	**2**
14.	What is meant by “Effective shear strength parameters”?	**4**	**2**
15.	What are called “Pore pressure parameters”?	**4**	**2**
16.	How the liquefaction occur in soil?	**4**	**2**

17.	Differentiate "Finite slope" and "Infinite slope".	**5**	**2**
18.	What is meant by "Stability number"?	**5**	**2**
19.	Define factor of safety with respect to friction and shear strength.	**5**	**2**
20.	What are the different modes of failure in soil slope?	**5**	**2**

PART- B (5x 10=50Marks)

		Marks	CO	RBT LEVEL
21.(a)	A sample of wet silty clay soil has a mass of 126 kg. The following data were obtained from laboratory tests on the sample: Wet Density = 2.1 g/cc, Specific Gravity of Soil Solids = 2.7 and Water Content = 15%. Determine dry density, porosity, void ratio, degree of saturation, air content and percentage of air voids.	**(10)**	**1**	**3**
	(OR)			
(b)	Earth is required to be excavated from borrow pits for building as embankment. The wet unit weight of undisturbed soil is 18 kN/m^3 and its water content is 8%. In order to build a 4 m high embankment with top width 2 m and side slopes 1: 1, estimate the quantity of earth required to be excavated per meter length of embankment. The dry unit weight required in the embankment is 15 kN/m^3 with a moisture content of 10%. Assume the specific gravity of solids as 2.67. Also determine the void ratios and the degree of saturation of the soil in both the undisturbed and remolded states.	**(10)**	**1**	**3**
22.(a)	Elaborate the "Constant head and Falling head permeability" test in detail with neat sketch.	**(10)**	**2**	**2**
	(OR)			
(b)	Illustrate how to arrive the coefficient of permeability in confined and unconfined aquifer with a neat sketch.	**(10)**	**2**	**2**
23.(a)	Discuss in detail about "Logarithmic of time fitting" method to find coefficient of consolidation of soil.	**(10)**	**3**	**2**
	(OR)			
(b)	Derive the Terzaghi's one dimensional consolidation equation. Highlight the assumptions made in it.	**(10)**	**3**	**2**

24.(a)	A direct shear test, when conducted on a remolded sample of sand, gave the following observations at the time of failure: Normal load = 288 N, Shear load = 173 N. The cross sectional area of the sample = 36 cm^2. Determine the angle of internal friction of the soil and the magnitude of the principal stress in the zone of failure.	**(10)**	**4**	**3**
	(OR)			
(b)	A saturated specimen of cohesionless sand was tested under drained conditions in a triaxial compression test apparatus and the sample failed at a deviator stress of 482 kN/m^2 and the plane of failure made an angle of 60 degree with the horizontal. Find the magnitudes of the principal stresses. What would be the magnitudes of the deviator stress and the major principal stress at failure for another identical specimen of sand if it is tested under a cell pressure of 200 kN/m^2?	**(10)**	**4**	**3**
25.(a)	Explain the different methods of slope protection in detail with neat sketch.	**(10)**	**5**	**2**
	(OR)			
(b)	Explain friction circle method of slope stability analysis in detail with neat sketch.	**(10)**	**5**	**2**

PART- C (1x 10=10Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	A cylindrical sample of soil having cohesion of 80 kN/m^2 and an angle of internal friction of 20 degrees is subjected to a cell pressure of 100 kN/m^2. Determine the maximum deviator stress at which the sample will fail and the angle made by the failure plane with the axis of the sample.	**(10)**	**4**	**3**