Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY

Summer Examination-2022

Subject Name : Geotechnical Engineering - I

Subject Code : 4TE05GTE1 **Branch: B.Tech (Civil)**

Semester: 5 **Date: 26/04/2022** **Time: 11:00 To 02:00** **Marks: 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1		**Define the following terms:**	**(14)**
	a)	Coefficient of curvature	01
	b)	Aeolin soil	01
	c)	Relative density	01
	d)	Laterites	01
	e)	Flocculent structure	01
	f)	Shrinkage limit	01
	g)	Specific gravity	01
	h)	Colluvial soil	01
	i)	Dispersed structure	01
	j)	Loam	01
	k)	Silt	01
	l)	Peat	01
	m)	Honeycomb structure	01
	n)	Uniformity coefficient	01

Attempt any four questions from Q-2 to Q-8

Q-2		**Attempt all questions**	**(14)**
	a)	A sample of wet soil has a weight of 360 N and a volume of 0.018 m3 . If the samples are drying out the soil in an oven its weight reduces to 315 N. Calculate the following: (a) bulk unit weight (b) water content (c) void ratio (d) porosity (e) degree of saturation (f) dry unit weight. Take the specific gravity of soil 2.61.	**07**
	b)	Two clay specimen A and B of thickness 3cm and 4 cm have void ratio 0.65 and 0.70 respectively under a uniform load of 25 KN/m2 , the void ratio of the two soils reduced to 0.48 and 0.60 respectively. Calculate the ratio of the coefficients of permeability of the two specimens. The time required by specimen A to reach 50 % consolidation is one third of that required by specimen B.	**07**
Q-3		**Attempt all questions**	**(14)**
	a)	State Stoke's law. What is its use in sedimentation analysis?	**07**

b) Derive Laplace equation for 2-dimension flow of water through a soil mass. **07**

Q-4 **Attempt all questions** **(14)**

a) Describe the consolidation mechanisms with neat sketch. **07**

b) Explain in detail about "quick condition" **07**

Q-5 **Attempt all questions** **(14)**

a) Following data were recorded while performing the compaction test: **07**

Water content (%)	7.71	11.5	14.6	17.5	19.5	21.25
Bulk density (kN/m3)	17.55	19.5	21.0	20.55	20.30	19.80

Plot the MDD-OMC curve and obtain the optimum water content and maximum dry density. Also plot zero air voids curve. Take G=2.66

b) Two soils Soil A and Soil B are tested in the laboratory for the consistency limits. The results are as follow: **07**

	Soil A	Soil B
Plastic Limit	20%	22%
Liquid Limit	40%	58%
Flow Index	11	6
Water content	41%	48%

From the test results calculate its properties and give the answer of following questions: 1) Which soil is more plastic? 2) Which soil is better foundation material when remoulded? 3) Which soil has better strength as a function of water content? 4) Which soil has better strength at the plastic limit?

Q-6 **Attempt all questions** **(14)**

a) Explain the theory of Adsorb water. **06**

b) A vane 10.8 cm long and 9 cm in diameter was lowered into soft clay at the bottom of bore hole. Torque was applied and value of failure was 54 N-m. Subsequently, the vane was rotated rapidly such that the soil becomes remoulded. The value of torque at failure for remoulded soil was 18 N-m. Determine the shear strength of clay in the natural and remoulded state and also find the value of sensitivity **08**

Q-7 **Attempt all questions** **(14)**

a) Explain Mohr's Coulomb theory. **07**

b) Enlist and explain factors affecting the permeability. **07**

Q-8 **Attempt all questions** **(14)**

a) Explain how soils are classified using unified soil classification **07**

b) Explain how the results of consolidation test can be used to predict the settlement of a structure caused by the consolidation of clayey soil below foundation. **07**