Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY

Winter Examination-2021

Subject Name : Geotechnical Engineering - I

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

Semester: 5 **Date: 20/12/2021** **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:** **(14)**

a) Loam 01
b) Shrinkage limit 01
c) Specific gravity 01
d) Honeycomb structure 01
e) Uniformity coefficient 01
f) Dispersed structure 01
g) Coefficient of curvature 01
h) Aeolin soil 01
i) Relative density 01
j) Silt 01
k) Peat 01
l) Laterites 01
m) Flocculent structure 01
n) Colluvial soil 01

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

Q-2 **Attempt all questions** **(14)**

a) 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**

b) 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

Q-3 **Attempt all questions** **(14)**

a) A sample of wet soil has a weight of 360 N and a volume of 0.019 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 2.65. **07**

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

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

a) State Stoke's law. What is its use in sedimentation analysis? **07**

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

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

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

b) Two soils Soil A and Soil B are tested in the laboratory for the consistency limits. The results are as follow: **08**

	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) Describe the consolidation mechanisms with neat sketch. **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-7 **Attempt all questions** **(14)**

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

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

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

a) Write a short note on "quick condition" **07**

b) A vane 10.4 cm long and 8 cm in diameter was lowered into soft clay at the bottom of bore hole. Torque was applied and value of failure was 50 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 **07**