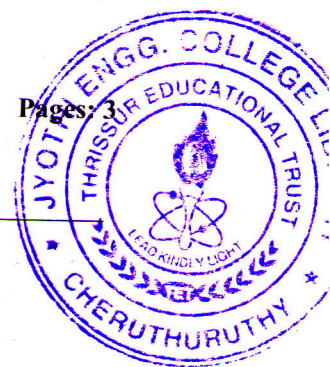02000CE208052002

Reg No.:_____

Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Fourth semester B.Tech examinations (S), September 2020

Course Code: CE208
Course Name: GEOTECHNICAL ENGINEERING I (CE)

Max. Marks: 100

Duration: 3 Hours

(Assume suitable data whereever necessary. Graph sheets may be supplied on request)

PART A
Answer any two full questions, each carries 15 marks

			Marks
1	a)	Explain with a neat sketch the three phase diagram for soil. Define air content and percentage air voids with the help of phase diagram.	5
	b)	Derive from the first principle the expression $\gamma_b = ((G+Se)\gamma_w)/(1+e)$.	6
	c)	Calculate the void ratio and dry density of the soil sample with 25% prorosity if the specific gravity is 2.75.	4
2	a)	The insitu density of soil is $16 kN/m^3$. The weight of soil filled in a one litre container in its loosest state and densest state are 15N and 17N respectively. What is the density index of the soil? G =2.67	4
	b)	The plastic limit and plasticity index of the soil are 13% and 10 respectively. If the natural water content of the soil is 18%. Determine the following. a) Liquid Limit b)Liquidity Index c) Consistency Index	5
	c)	Define uniformity coefficient and coefficient of curvature and its importance.	6
3	a)	A partially saturated sample from a borrow pit has a natural water content of 14% and bulk unit weight of $19 kN/m^3$. The specific gravity of solids is 2.70. Determine the void ratio and degree of saturation. What will be the unit weight of the sample on saturation?	8
	b)	Define Stoke's law and its limitations.	4
	c)	Classify the soil with justifications; Cu=7, Cc=2, % Gravel =20%, % Sand =75%.	3

PART B
Answer any two full questions, each carries 15 marks

4	a)	Define i)Effective stress ii) Quick Sand Condition iii)Phreatic Line	5
	b)	A 8m thick soil profile consists of 5m depth sand layer above a 3m depth clay layer. The water table is at 3m below the ground level. The sand above water	10

table is 40% saturated. The void ratio of sand layer is 0.6 with a specific gravity of 2.65. The clay layer has a water content of 45% with a specific gravity of 2.70. Draw the Total, neutral and effective stress diagram up to a depth of 8m. Neglect capillary flow.

5 a) What are the advantages of triaxial test over direct shear test?   4

   b) A vane 108mm long and 72mm in diameter was pressed into a soft clay at the bottom of the bore hole. Torque was applied and its value at failure was 45N.m. Find the shear strength of the clay on the horizontal plane. If the top of the vane 5 is flush with the surface of the soft clay, find the torque that is required to be applied for failure

   c) In a drained triaxial test on a dense sand the cell pressure was 150kPa and the deviator stress to cause failure was 540kPa. Calculate the angle of internal 6 friction. Also find the angle made by the failure plane with respect to the major principal plane.

6 a) A sample in a variable head permeameter is 100mm in diameter and 120mm high. The permeability of the sample estimated to be 10^{-3}mm/s. If it is desired 4 that the head in the stand pipe should fall from 250mm to 100mm in 180s, determine the size of the stand pipe to be used.

   b) The following results were obtained when a loose silty sand was tested in a 7 direct shear test.

Normal stress (kN/m^2)	125	235	345
Maximum Shearing Stress (kN/m^2)	95	160	237

Determine:

a) the shear strength parameters for the soil

b) the magnitude of principal stresses and the orientation of principal planes.

   c) Write the laboratory tests to determine the shear strength parameters of soil.   4

PART C
Answer any two full questions, each carries 20 marks

7 a) What are the assmptons in Terzaghi's one dimensional consolidation theory   5

   b) In a laboratory consolidometer test on a 20mm thick sample of saturated clay taken from a site, 50% of the consolidation was reached in 10minutes. Estimate the time required for the clay layer of 5m thickness at the site for 50% compression if the bottom is impervious. Assume that the laboratory sample and 9 the clay sample at the site are both subject to the same increase in stress. How

much time will take the clay layer to reach 90% consolidation? What is the time required for the clay layer to reach 50% consolidation if the clay has double drainage? (represent the time in years)

   c)   Define   i) primary consolidation settlement   ii) secondary consolidation   6   settlement   iii) Degree of consolidation.

8   a)   Define i) Relative compaction   ii) zero air void line   iii) optimum moisture   6   content

   b)   A cohesive soil yields a MDD of 1.8g/cc at an OMC of 16% during standard proctor test. If the value of G is 2.65, What is the degree of saturation? What is   6   the maximum dry density to which it can be further compacted to?

   c)   Explain the friction circle method of analysis of stability of earth slopes   8

9   a)   What is coefficient of consolidation of soil? How will you evaluate it with   7   square root time method?

   b)   A cutting is to be made in clay for which the cohesion is $35kN/m^2$ and $\Phi=0$. The density of soil is $20kN/m^3$. Find the maximum depth for a cutting of side   3   slope 1.5 to 1, if the factor of safety is to be 1.5. Take Taylor's stability number for a 1.5 to 1 slope for $\Phi=0$ as 0.17.

   c)   A certain clay layer has a thickness of 5m. After one year when the clay was 50% consolidated 8cm of settlement had occurred. For a similar clay and   10   loading conditions how much settlement would occur at the end of one year and 4 years, if the thickness of this new layer is 25m?

****