Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

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

Max. Marks: 100   Duration: 3 Hours
Graph sheets can be used.

PART A
Answer any two full questions. Each question carries 15 marks.

1 a) Define void ratio, porosity, water content and degree of saturation   5
   b) Derive an equation to express the bulk density of a soil mass in terms of its void   5
       ratio, water content, specific gravity, degree of saturation and density of water
   c)   The bulk density and dry density of a partly saturated soil sample are 1.98 g/cc   5
       and 1.56 g/cc respectively. Determine the porosity, water content and degree of
       saturation of the soil. Given, G = 2.72
2 a) State Stoke's law. What are the limitations of Stoke's law.   5
   b) The results of sieve analysis performed in a soil are given below.   10
       The mass of dry sample taken for the test was 300g.Draw the particle size
       distribution curve and determine the uniformity coefficient and coefficient of
       curvature and comment on the result.

Sieve size	4.75mm	2.4mm	1.2mm	600μ	425 μ	300 μ	150 μ	75 μ
Mass of soil retained (g)	19.4	24.96mm	29.37	36.88	45.74	47.99	37.74	57.92

3 a) The bulk density and moisture content of a partly saturated soil sample are 1.79   7
       g/cc and 18% respectively. The specific gravity of solids is 2.7.Determine the void
       ratio, degree of saturation and dry density
   b) Draw the plasticity chart as per Indian Standards and classify the soil having the   8
       following values of Atterberg limitsLL = 41%, PL = 29%, SL = 17%

PART B
Answer any two full questions. Each question carries 15 marks.

4 a) State Darcy's law. Define coefficient of permeability of a soil from this law.   5

   b) The subsoil at a site consists of 2m thick layer of clay, which is underlain by a   10
       deep sand layer. The ground water table is at 3m below GL. Unit weight of clay is
       18kN/m^3, while that of sand above and below water table are 15.5 and 18.2 kN/m^3
       respectively. Find out the total, neutral and effective stress at a depth of 5m below
       ground level. The unit weight of water may be taken as 10kN/m^3.

5 a) What is pole of a Mohr's circle? Explain with a sketch how it can be used to   7
       determine the stresses on any plane in a soil element subjected to external stresses.
   b) If the major and minor principal stresses through a mass of soil at the instant of   8

failure are 6kPa and 2kPa respectively. Calculate the normal and shear stress on a plane making an angle of 30° with the direction of minor principal stress.

6

a) Derive an expression for the effective stress at a depth 'Z' in a soil mass when the direction of flow of water through the soil is (i) downward (ii) upward   7

b) In a falling head permeability test, the water level in the stand pipe dropped from 40 to 20cm in 1 hour. The diameter of the sample and stand pipe were 8cm and 0.5cm respectively, while the height of the sample was 9.5cm.Determine the coefficient of permeability of soil in m/day   8

PART C
Answer any two full questions. Each question carries 20 marks

7
a) Define compression index. How can it be determined from a consolidation test?   5
b) Distinguish between normally consolidated soil, under consolidated soil and an over consolidated soil.   5
c) A 2m clay stratum is overlain by a 3.5m thick sand stratum and underlain by a rock. The saturated densities of sand and clay are 1850 and 1980 kg/m^{3}respectively.The ground water table is at the ground level. It has been estimated that the vertical stress intensity at the middle of the clay layer is likely to increase by 50% due to the construction of a structure. Estimate the compression of the clay stratum.
Given coefficient of volume change = 0.023 cm^2/kg.   10

8
a) Explain the friction circle method of determination of the factor of safety of a given slope with respect to a given slip circle.   10
b) The optimum moisture content and maximum dry density of a soil obtained from the standard Proctor's tests are 18% and 1.67g/cc. If the sp. Gravity of soil solids is 2.7, determine the degree of saturation of the soil at OMC and the dry density corresponding to a zero air voids condition at OMC   10

9
a) Explain the procedure for determination of coefficient of consolidation by square root of time fitting method.   10
b) Derive an expression for factor of safety against sliding in a cohesionless soil.   5
c) What do you understand by light compaction and heavy compaction? Under what circumstances are light and heavy compaction tests are carried out in the laboratory?   5

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