Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2017

CE208: GEOTECHNICAL ENGINEERING I (CE)

Max.Marks : 100 Duration : 3 Hours

(Assume any missing data, Graph sheets can be used.)

PART A

Answer any two questions in full.

1. (a) Using phase diagram, define the terms (i) void ratio (ii) Degree of saturation (iii) water content and (iv) specific gravity. (7)

   (b) A partially saturated soil sample obtained from an earth fill has a natural water content of 26% and unit weight 19.74 kN/ m^3. Assuming specific gravity of solids is 2.68. Compute: (i) Degree of saturation (ii) void ratio (iii) porosity and (iv) air content. (8)

2. (a) Sketch the plasticity chart used for classifying fine grained soil according to IS classification system. Give the group symbol for the following soil according to IS classification system

   i) percentage of soil passing 75 micron sieve = 3%

   ii) Percentage of coarse fraction passing 4.75 mm sieve = 70%

   iii) Uniformity coefficient = 7

   iv) Co efficient of curvature = 3 (7)

   (b) What is the use of particle size distribution curve? With the help of particle size distribution curve define the following terms (i) well graded soil (ii) poorly graded soil (iii) gap graded soil and (iv) effective size. (8)

3. (a) Following are the results obtained from the liquid and plastic limit tests for a soil.

   Observations of liquid limit:

No. of blows	Moisture content(%)
13	27
18	23
29	22

The plastic limit is 15.5%. (i) draw the flow curve and obtain the liquid limit (ii) Determine the liquidity index of soil when the insitu moisture content is 18% (iii) Plasticity index . (7)

(b) Differentiate between (i) sensitivity and thixotropy (ii) consistency index and flow index (iii) Density index and density (iv) Absolute specific gravity and apparent specific gravity. (8)

PART B

Answer any two questions in full.

4. (a) The following data were recorded in a constant head permeability test. Internal diameter of permeameter = 7.5 cm. Head loss over a sample length of 18cm. = 24.7cm. Quantity of water collected in 60sec. = 626 ml. porosity of the soil sample was 44%, calculate the coefficient of permeability of the soil. Also, determine the seepage velocity during the test. (7)

   (b) A layer of saturated clay 4m. thick is overlain by sand 5m. deep the water table being 3m. below the surface. The saturated unit weights of the clay and sand are 19 and 20 kN/m^3 respectively, and the unit weight of sand above water table is $17kN/m^3$. Determine the values of total vertical stress and effective vertical stress at the bottom and interface layers. Also, plot their variations. (8)

5. (a) A shear box test on clean sand gave a failure stress of 70 kPa when the normal stress was 200kPa. Draw the Mohr circle and Mohr envelope and find the principal stresses at failure and the orientation of the principal planes. (7)

   (b) The results of a triaxial shear tests are given below:

Specimen No.	1	2
Minor principal Stress (σ_3)(kN/m^2)	17	44
Major principal stress(σ_1) (kN/m^2)	157	204
Pore pressure (U) (kN/m^2)	12	20

   Determine the shear strength parameters using effective stress analysis. (8)

6. (a) State Mohr-Coloumb theory. What are the different methods for finding out the shear parameters? Explain with figure the field method for finding out shear strength of soil. (7)

(b) Define the terms (i) quick sand condition (ii) exit gradient (iii) phreatic line and (iv) UU test. (8)

PART C

Answer any two questions in full.

7. (a) A 20 mm. thick specimen of soil takes 16 minutes to reach 50% consolidation in the laboratory when drainage is permitted from both ends. Calculate the coefficient of consolidation. Also, calculate the time required for 90% consolidation for the above sample. How much time will it take for 90% consolidation of 4m. thick similar sample in the field with double drainage? Also, calculate the time when drainage is permitted only from one side. (10)

   (b) A stratum of clay 8m. deep has w_L= 45%. The surface of clay is at 10m. below the present ground level, w = 40% and G = 2.78 for clay. Between ground surface and clay, the subsoil consists of fine sand. The ground water level is 4.5m. below ground level. The average submerged unit weight of sand is 10.4kN/m^3 and the unit weight of sand above the ground water level is 17kN/m^3. The clay is normally consolidated. The weight of structure coming on top of the sand above the clay increases the overburden pressure on clay by 40kN/m^2. Estimate the settlement of the building. (10)

8. (a) Explain the Swedish circle method for the analysis of slopes for a c-Ø soil. (10)

   (b) A proctor compaction test was conducted on a soil sample, and the following observations were made:

Water content(%)	8	11.5	14.5	17.5	19.5
Weight of wet soil (kg)	1.7	1.9	2.00	1.98	1.95

   If the volume of the mould used was 950cc and the specific gravity of the soil was 2.65, draw the dry density vs moisture content curve and find the optimum moisture content and maximum dry density. Also draw the zero air void line. (10)

9. (a) Explain the consolidation phenomenon using Terzaghi's spring analogy. (6)

   (b) (i)What is meant by stability number and stability chart? (ii) What are the different types of slope failures? (7)

   (c) What is meant by pre consolidation pressure? Explain the method for the estimation of pre consolidation pressure. (7)