Registration No :

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B.Tech
PCI3I103

3rd Semester Regular / Back Examination 2018-19
GEOTECHNICAL ENGINEERING
BRANCH : CIVIL
Time : 3 Hours
Max Marks : 100
Q.CODE : E881
Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1   **Short Answer Type Questions (Answer All-10)**   (2 x 10)
  a) Name at least five clay minerals.
  b) How do you define the gradation coefficient?
  c) Give some examples of detrital sedimentary rock.
  d) What is the importance of A-line in Plasticity Chart?
  e) What is capillary siphoning?
  f) Differentiate between 'isobar' and 'pressure bulb'.
  g) Sketch the stress ~ strain characteristics of a loose sand, a medium dense sand and a dense sand on a single chart.
  h) Explain 'face failure' 'slope failure' and 'toe failure' in slopes.
  i) What is the effect of pore pressure on shear strength of soil? Discuss.
  j) What is the effect of sudden draw down on stability of a slope?

Part- II

Q2   **Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 x 8)
  a) A cube of dried clay having sides 4cm long weighs 110 gm. The same cube of soil, when saturated at unchanged volume, weighs 135 gm. Determine the specific gravity of soil solids and the voids ratio.
  b) Discuss the IS soil classification system in brief.
  c) Define activity of a soil. Sketch and discuss the plasticity chart.
  d) Define 'critical hydraulic gradient' and explain how piping is produced and how to prevent it.
  e) Calculate the total, effective and pore water pressure at a depth of 12 m below the bottom of a lake 6 m deep. The bottom of the lake consists of soft clay with a thickness of more than 12 m. The average water content of the clay is 42%, and the specific gravity of soils may be assumed to be 2.66.
  f) A capillary permeability test was conducted in two stages under a head of 60 cm and 180 cm, respectively at the entry end. In the first stage, the wetted surface moved from 1.5 cm to 7 cm in 7 minutes. In the second stage it advanced from 7 cm to 18.5 cm in 24 minutes. The degree of saturation at the end of the test was 85% and the porosity was 35%. Determine the capillary head and the coefficient of permeability.
  g) Why compaction is required? How the soil properties get affected by compaction? What are various field compaction techniques? Discuss the necessity and use of Vibroflotation.
  h) A layer of soft clay is 6 m thick and lies under a newly constructed building. The weight of sand underlying the clayey layer produces a pressure of 260 kPa and the new construction increases the pressure by 100 kPa. If the compression index is 0.5, compute the settlement. Water content is 40% and specific gravity of grains is 2.65.
  i) Enumerate various methods to determine the coefficient of consolidation. Discuss the Logarithm-of-time fitting method.
  j) Discuss the Friction Circle method of stability analysis of slopes.

k) Discuss the Newmaark's Influence Chart'.

l) What are the characteristics of a flow net?

A flow net was drawn for an effective head of 8 m. It has 10 numbers of flow channels and 20 potential drops. If the hydraulic conductivity is 5.2×10^{-4} cm/sec, compute the quantity of seepage

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 The total unit weight (γ) of soil is 18.8 kN/m^3, the specific gravity (G) of the soil solid particles is 2.67 and the water content (w) of the soil is 12%. Calculate the dry unit weight(γ_d), void ratio(e) and the degree of saturation(S_r). **(16)**

Q4 A saturated soil stratum 6 meters thick lies above an impervious stratum and below a previous stratum. It has a compression index of 0.28 and a coefficient of permeability of 3.5×10^{-4} cm/sec. Its voids ratio at a stress of 150kN/m^2 is 1.95. Determine: **(16)**

a) The change in void ratio due to an increase of stress to 210kN/m2.

b) Settlement of the soil stratum due to the above increase in stress and

c) Time required for 50% consolidation. Assume time factor T_v for 50% consolidation as 0.20.

Q5 Laboratory results on a soil have shown that its unconfined compressive strength is 12N/cm^2. In triaxial compression test of a specimen of the soil when subjected to chamber pressure of 4 N/cm^2 failed at an additional stress of 16 N/cm^2. Estimate the shearing strength of same soil along a horizontal plane at a depth of 4 m in a deposit. The ground water table is at a depth of 2.5 m from the ground level. Take dry unit weight of soil as 17 kN/m^3 and specific gravity as 2.7. **(16)**

Q6 Discuss the IS soil classification system in brief. The particle size characteristics of a soil are given below. The soil has a liquid limit of 30% and plastic limit of 24%. (i) Draw the grain size distribution curve. (ii) Find coefficient of gradation and uniformity coefficient. (iii) Determine the percentages of gravel, sand, silt and clay in the soil. (iv) Classify the soil according to Indian Standards. **(16)**

Table 1

Size(mm)	% Finer
4.75	100
2	93
0.425	85
0.1	72
0.033	61
0.018	52
0.01	43
0.006	31
0.0036	22
0.002	16
0.001	04