USN | | | | | | | | | | **17CV45**

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Basic Geotechnical Engineering

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Define : (i) Void Ratio   (ii) Porosity   (iii) Air content   (iv) Degree of saturation
         (v) Water content.   **(05 Marks)**
    b.   Starting from 3-phase diagram, with usual notation prove that
         $$r_d = \frac{(1-n_a)Gr_w}{1+GW}$$ **(07 Marks)**
    c.   A sample of soil has a volume of 1000 C.C and a weight of 17.5N. The specific gravity of
         soil solid 2.52. If dryout weight is 15.8 kN/m^3, determine the water content, void ratio,
         submerged unit weight and degree of saturation.   **(08 Marks)**

OR

2   a.   Briefly explain consistency limit and indices and explain activity of clay.   **(08 Marks)**
    b.   The sample of sand above water table was found to have natural water content of 15% and
         unit weight of 18.484 kN/m^3. Laboratory test on a dry sample indicated e_{min} = 0.5 and
         e_{max} = 0.85 for densest and loosest state respectively. Compute the degree of saturation and
         relative density. Assume G = 2.65.   **(06 Marks)**
    c.   Explain various correction factors in hydrometer analysis.   **(06 Marks)**

Module-2

3   a.   Explain the concept of electrical diffuse double layer.   **(06 Marks)**
    b.   Mention three different clay mineral commonly found in soil. Explain any one with their
         structures.   **(06 Marks)**
    c.   Differentiate between :
         (i) Primary and secondary valency forces
         (ii) Flocculated structures and dispersed structures.   **(08 Marks)**

OR

4   a.   State and explain briefly the factors affecting compaction of soil.   **(06 Marks)**
    b.   Calculate the compactive energies applied for standard and modified proctor test.   **(06 Marks)**
    c.   Following are the observations of compaction test:

Water content %	7.7	11.5	14.6	17.5	19.5	21.2
Weight of wet soil (N)	16.67	18.54	19.92	19.52	19.23	18.83

         Volume of compaction mould = 950 cc
                              G = 2.65
         (i)   Draw compaction curve   (ii) Report the MOD and OMC
         (iii) Draw 100% saturation line.   **(08 Marks)**

Module-3

5   a.   With a neat sketch, explain the method of locating phreatic line for homogeneous earth dam
         with horizontal filter.   **(06 Marks)**

b. Explain the following terms:
   (i) total stress   (ii) Neutral stress   (iii) effective stress   (iv) Quick sand condition.
   (08 Marks)

c. A 1.25m layer of soil, G = 2.65 and porosity = 35% is subject to an upward seepage head of 1.85m. What depth of coarse and would be required above the soil to provide a factor of safety of 2.0 against piping assuming that the coarse sand has same porosity and specific gravity as soil and that there is negligible headloss in the sand. **(06 Marks)**

OR

6 a. Briefly explain the factors affecting the permeability of soils. **(10 Marks)**

   b. Derive an expression for coefficient of permeability used in variable head permeability test. **(10 Marks)**

Module-4

7 a. What is a pre-consolidation pressure? Explain the Casagrande's method of determining the pre-consolidation pressure from laboratory consolidation test. **(08 Marks)**

   b. Write short note on pore water pressure in soils. **(06 Marks)**

   c. A soil sample 20mm thick takes 20 minutes to reach 20% of consolidation. Find the time taken by for a clay layer 6m thick to reach 40% consolidation. Assume double drainage in both the cases. **(06 Marks)**

OR

8 a. With spring analogy, explain consolidation. **(10 Marks)**

   b. A saturated soil has a compression index of 0.25. Its void ratio at a stress of 10 kPa is 2.02 and its permeability is 3.4×10^{-7} mm/s Compute.
   (i)   Change in void ratio if stress is increased to 19 kN/m^2
   (ii) Settlement in (i) if he soil stratum is 5m thick
   (iii) Time required for 40% consolidation if drainage is one way. **(10 Marks)**

Module-5

9 a. List the merit and demerits of triaxial shear test over Direct Shear test. **(08 Marks)**

   b. Explain the classification of shear test based on drainage condition. **(06 Marks)**

   c. In an unconfined compression test, a sample of sandy clay 8 cm long and 4 cm diameter fails under a load of 120 N at 10% strain. Compute the shearing resistance taking into account the effect of change in cross-section of the sample. **(06 Marks)**

OR

10 a. Explain Mohr-Coulomb failure theory of soil. **(06 Marks)**

   b. What are factors affecting the shear strength of soil. **(06 Marks)**

   c. In a shear test conducted on a river sand, the following result were obtained.

Normal force (N)	80	160	240	320	400	480
Shear force (N)	50	101	149	201	248	302

   Determine 'C' and 'ϕ'. **(08 Marks)**

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