CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

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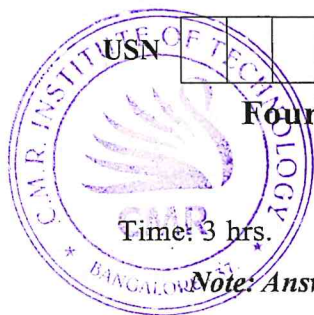## Basic Geotechnical Engineering

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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