BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B TECH   SEMESTER : V
BRANCH: CEE   SESSION : MO/2022

SUBJECT: CE303 GEOTECHNICAL ENGINEERING

TIME: 3:00 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. **Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)   Derive the relation between dry density and bulk density   [2]
Q.1(b)   Summarize the Indian Standard Classification System of soil   [3]
Q.1(c)   An oven dried sample of soil has a volume of 300cm^3 and a mass 480g. If G = 2.65, determine voids   [5]
         ratio and shrinkage limit. Calculate the water content which will fully saturate the soil and cause an
         increase in volume equal to 10% of original dry volume.

Q.2(a)   Describe quick sand.   [2]
Q.2(b)   Derive the equation to find average permeability for a stratified soil deposit with 3 layers if the flow   [3]
         is perpendicular to the bedding planes,
Q.2(c)   A stratum of clay with an average liquid limit of 46% is 8m thick. Its surface is located at a depth of   [5]
         11m below the present ground surface. The natural water content of the clay is 38% and the specific
         gravity of soil grains is 2.7. Between the ground surface and clay the sub- soil consists of fine sand.
         The water table is located at 4 m below the ground surface. The average submerged unit of sand is
         10.6 kN/m^3 and unit weight of sand located above water table is 17.2 kN/m^3. The effective
         overburden pressure on clay is likely to increase by 42kN/m^2 due to the construction of a building.
         Estimate the settlement of the building. Clay- normally consolidated.

Q.3(a)   Explain any two disadvantages of Direct Shear Box test.   [2]
Q.3(b)   Summarize Mohr-Coulomb failure theory.   [3]
Q.3(c)   A cylindrical soil specimen having cohesion 80 kN/m^2 and angle of internal friction 21^0 is subjected to   [5]
         a cell pressure of 100kN/m^2 in a triaxial testing machine. Compute the a) maximum deviator stress b)
         angle made by the failure plane with the axis of the specimen c) normal and shear stresses on the
         failure plane.

Q.4(a)   Distinguish between gross pressure intensity and net pressure intensity.   [2]
Q.4(b)   List out the corrections to be applied to SPT value and the reasons to apply.   [3]
Q.4(c)   A plate load test was carried out on a ground having a uniform sand stratum up to sufficient depth.   [5]
         The size of the plate used was 30cm x 30cm

Load (KN)	4.5	9	18	27	36	45	54
Settlement (mm)	0.75	1.25	2	3.5	5.38	7.75	10.75

         Plot the load settlement curve. Also determine the bearing capacity and load that can be taken by a
         column footing of size 1.2m x 1.2m in this soil for an allowable settlement of 2 cm

Q.5(a)   Differentiate between Strap footing and Mat footing.   [2]
Q.5(b)   Describe negative skin friction.   [3]
Q.5(c)   It is proposed to provide pile foundation for a heavy column; the pile group consisting of 4 piles   [5]
         placed at 2 m c/c, forming a square pattern. The under-ground soil is clay, having average c_u as 40
         kN/m^2. Compute the allowable column load on the pile cap, if the piles are circular having diameters
         0.5 m each and length 10m.