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

CLASS: BE **SEMESTER : III**
BRANCH: CIVIL **SESSION : MO/18**

SUBJECT: CE3005-GEOTECHNICAL ENGINEERING I

TIME: 03:00 HRS. **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
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) Differentiate between flocculated and dispersed structure. [2]
(b) Derive the functional relationship of saturated unit weight in terms of specific gravity and porosity. [4]
(c) A soil sample has a diameter of 38mm and a height of 76mm. Its wet weight is 1.15N. Upon drying its weight reduced to 0.5N. G_s = 2.7. Compute the degree of saturation and the water content of the soil sample. Comment on the values of both. [6]

Q.2(a) Explain Activity of clays. [2]
(b) Define (i) Black Cotton Soil (ii) Marl (iii) Loam (iv) Aeolin deposit. [4]
(c) Prove $M_D = 100GR/[M_d(G-1)]$, symbols having their standard significance. [6]

Q.3(a) Discuss the concept of effective stress. [2]
(b) Describe the phenomenon of capillary siphoning. [4]
(c) Prove that for stratified deposits of soils, average permeability in the horizontal direction is greater than the average permeability in the vertical direction. [6]

Q.4(a) State the process of compaction. [2]
(b) Compare between Standard Proctor & Modified Proctor test. [4]
(c) In a consolidation test on clay, voids ratio decreased from 1.04 to 0.92 when pressure was increased from 100 kN/m^2 to 200 kN/m^2. Coefficient of permeability of the soil during the pressure increment was $1x10^{-5}$ cm/s. Calculate the coefficient of compressibility, coefficient of volume change & the coefficient of consolidation. [6]

Q.5(a) Elaborate to interpret CU & CD tri-axial tests. [2]
(b) A vane 10cm height and 8cm in diameter was pressed into soft clay at the bottom of the bore hole. Torque was applied and at 45 Nm failure took place. Subsequently the soil was remolded and then it was sheared at a torque of 18Nm. Determine the cohesion of the clay in the natural and remolded states and also the value of sensitivity to classify it. [4]
(c) Validate, symbols having their standard significance, [6]

$$\sigma_1' = \sigma_3'\left(\frac{1+\sin\phi'}{1-\sin\phi'}\right) + 2c'\sqrt{\frac{1+\sin\phi'}{1-\sin\phi'}}$$

Q.6(a) Write about active earth pressure. [2]
(b) Establish the expression for passive earth pressure coefficient in case of cohesion-less soils. [4]
(c) Enumerate & demonstrate the procedure to solve for active pressure acting against a rough inclined wall supporting an inclined surcharge using Rebhann's construction. [6]

Q.7(a) Write about Taylor's stability number. [2]
(b) Appraise face failure, toe failure and base failure of finite slope with the aid of illustrations. [4]
(c) It is required to make a 6m deep excavation in a stratum of soft clay having a unit weight of 18 kN/m^3 and cohesion of 26kN/m^2. A rock layer exists at a depth of 9m below the GL. Determine the FOS of the slope against sliding if the slope angle is 40°. Given, required S_n = 0.172. [6]

********30.11.18******E**