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

CLASS: MTECH **SEMESTER : I**
BRANCH: CIVIL **SESSION : MO/18**

SUBJECT: CE515 ADVANCED SOIL MECHANICS

TIME: 3 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) Evaluate the clay minerals Kaolinite, Illite & Montmorillonite & hence justify their different engineering behavior. [5]

Q.1(b) Illustrate the DTA & explain its utility in micro level investigation of soil behavior. [5]

Q.2(a) Write notes on (i) gas pressure in bubbles & voids & (ii) sorption curves. [5]

Q.2(b) Describe any two suitable methods for measurement of soil suction phenomenon. [5]

Q.3(a) Validate the choice of shear parameters for design. [5]

Q.3(b) Analyze stress paths in tri-axial tests. [5]

Q.4(a) Rewrite the behavior of NC clays & propose how to develop the Roscoe surface. [5]

Q.4(b) A sample of clay (Sample A) is isotropically normally consolidated to 400 kN/m^2 having v_0 of 2.052. Another sample B is isotropically consolidated to 863 kN/m^2 & allowed to swell to 40 kN/m^2 when v_0 is 2.052. Both samples are then subjected to standard undrained compression tests. The values of the soil constants for the clay are Γ = 3.16, λ = 0.2 & M = 0.94. Compute the pore pressure at failure of each sample. [5]

Q.5(a) Establish the critical state line for sand. [5]

Q.5(b) A soil has M = 1.02, Γ = 3.17, λ = 0.20, κ = 0.05 & N = 3.32. Two samples A & B are isotropically normally consolidated in a triaxial apparatus to p' = 200kN/m^2 & u = 0 & each is then subjected to a loading test in which the total axial stress is increased to σ_a = 220 kN/m^2 while the radial stress is held constant; Sample A is loaded drained with u = 0 & Sample B is loaded undrained with ε_v = 0. Use Cam = clay theory to estimate the shear & volumetric strain & the change of pore pressure for each sample. [5]

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