BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

II Semester 2017-2018

Mid-Semester Examination (6-3-2018) Duration: 1.5 hours

Course: CE F243 (Soil Mechanics) Open Book Max. Marks: 75

Use both sides of answer sheet. Start each answer on fresh page. Strike rough work done on last page(s) of answer sheet.

1. The in-situ density of an embankment, compacted at a water content of 15% was determined with the help of a core cutter. The empty mass of the cutter was 1300gm, and the cutter full of soil had a mass of 3200gm, the volume of cutter being 1000cm^3. Determine the bulk density, dry density and the degree of saturation of the embankment. If the embankment becomes fully saturated during rains, what would be its water content and saturated unit weight. Assume no volume change in soil on saturation. Density of water = 1gm/cm^3. G = 2.70. [12]

2. During hydrometer analysis, the hydrometer reading in a 1000cc uniformly mixed soil suspension at the instant of starting of sedimentation (t = 0) was 27. After 30 min, the hydrometer reading for an effective depth of 13cm was noted to be 10. For G = 2.65 and viscosity of water = 0.01/980.7 gm-sec/cm^2, find: (a) the total weight of soil solids placed in the 1000cc suspension, and (b) the diameter corresponding to the 30 min reading and the percentage finer. γ_{water} = 1gm/cm^3. [5 + 10 = 15]

3. Based on the information given below, classify the soil as per ISSCS:
(i) % retained on 4.75mm sieve = 45%, (ii) % retained on 75micron sieve = 82%. (iii) C_c = 2, C_u = 3, (iv) W_l = 40%, I_p = 13. [10]

4. A layer of saturated clay 5-m thick is overlain by sand 4-m deep. The water table is 3-m below the top surface. The saturated unit weights of clay and sand are 16 and 18 kN/m^3 respectively. Above the water table, the unit weight of sand is 15kN/m^3 respectively. Calculate the effective stress on a horizontal plane at a depth of 9-m below ground surface. What will be the increase in effective stress at 9-m depth if soil gets saturated by capillarity upto a height of 1-m above water table. γ_w = 9.81 kN/m^3. [14]

5. In a falling head permeameter test, the initial head is 60cm. The head drops by 15cm in 10 minutes. Calculate the time required to run the test for final head to be at 25cm. If the sample is 12cm in height and 50cm^2 in cross-sectional area, calculate the coefficient of permeability, taking area of stand pipe = 0.5cm^2. [12]

6. A soil in the borrow pit is at a dry density of 19kN/m^3 with a moisture content of 12%. The soil is excavated from this pit and compacted in an embankment to a dry density of 22kN/m^3 with a moisture content of 17%. Compute the quantity (weight and volume) of soil to be excavated from the borrow pit and the amount of water to be added for 100m^3 of compacted soil in the embankment. [12]