Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **14CE2007** | **Duration :** | **3hrs** |
| **Sub. Name :** | **SOIL MECHANICS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Describe the laboratory method for the determination of specific gravity. | CO2 | 10 |
| b. | A fully saturated clayey sample has a mass of 130g and has a volume of 64cm3. The sample mass is 105g after oven drying. Assuming that the volume does not change during drying, determine (i) Specific gravity of the solids (ii) voids ratio (iii) porosity (iv) dry density. | CO1 | 6 |
| c. | Derive the relationship between void ratio and porosity. | CO1 | 4 |
| **(OR)** | | | | |
| 2. | a. | A constant head permeability test was run on a sand sample 30cm in length and 20cm2 in area. When a loss of head was 60cm, the quantity of water collected in 2 minutes was 250ml. Determine the coefficient of permeability of the soil. | CO1 | 4 |
| b. | List out the factors affecting permeability of soils. | CO1 | 6 |
| c. | In a falling head permeability test the length and area of cross section of soil specimen are 0.17m and 21.8 x 10-4 m2 respectively. Calculate the time required for the head to drop from 0.25m to 0.10m. The area of cross section of stand pipe is 2 x 10-4m2. The sample has three layers with permeabilities 3 x 10-5m/sec for first 0.06m, 4 x 10-5 m/sec for second 0.06m and 6 x 10-5 m/sec for the third 0.05m thickness. Assume the flow is taking place perpendicular to the bedding plane. | CO1 | 10 |
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| 3. | a. | Describe the method for determination of liquid, plastic and shrinkage limit of soil. | CO2 | 15 |
| b. | Breifly explain the classification of soil by Indian standard classification system. | CO2 | 5 |
| **(OR)** | | | | |
| 4. | a. | Define relative density. Explain the method to determine the relative density of soil. | CO1 | 8 |
| b. | In its natural condition, a soil sample has a mass of 1.980 kg and a volume of 0.001 m3. After being completely dried in an oven, the mass of the sample is 1.800 kg. Specific gravity G is 2.7. Unit weight of water is 10 kN/m3. What is the degree of saturation of the soil? | CO1 | 6 |
| c. | Sketch the particle size distribution curve for fine grained soil, well graded soil, coarse grained soil, and uniformly graded soil. | CO1 | 6 |
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| 5. | a. | Discuss the different methods of compaction adopted in the field. | CO3 | 10 |
| b. | Differentiate between consolidation and compaction. | CO3 | 4 |
| c. | Define compaction curve. Give its salient features. What is a zero-air void line? | CO3 | 6 |
| **(OR)** | | | | |
| 6. | a. | Describe the consolidometer test. Show how the results of this test are used to predict the rate of settlement and the magnitude of settlement. | CO3 | 12 |
| b. | Differentiate between primary consolidation and secondary consolidation. | CO3 | 4 |
| c. | A clay stratum 5m thick has the initial void ratio of 1.50 and the effective over-burden pressure of 120 kN/m2. When the sample is subjected to an increase of pressure of 120 kN/m2, the void ratio reduces to 1.44. Determine the coefficient of the volume compressibility and the final settlement of the stratum. | CO3 | 4 |
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| 7. | a. | The water table in a deposit of sand 8 m thick is at a depth of 3m below the surface. Above the water table, the sand is saturated with capillary water. The bulk density of sand is 19.62 kN/m3. Calculate the effective pressure of 1m, 3m, 5m and 8m below the surface. Hence plot the variation of total pressure, neutral pressure and effective pressure over the depth of 8 m. | CO3 | 12 |
| b. | Explain the effect of surcharge and the capillary action on the effective stress. | CO3 | 8 |
| **(OR)** | | | | |
| 8. | a. | Un-drained triaxial tests are carried out on four identical specimens of silt clay, and the following results are obtained:   |  |  |  |  | | --- | --- | --- | --- | | Sample No. | Cell pressure  ( kN/m2) | Deviator stress at failure( kN/m2) | Pore pressure ( kN/m2) | | 1 | 50 | 350 | 5 | | 2 | 100 | 440 | 10 | | 3 | 150 | 530 | 12 | | 4 | 200 | 610 | 18 |   Determine the value of the effective angles of shearing resistance and the cohesion intercept by plotting (i) conventional failure envelope from Mohr circles, (ii) modified failure envelope. | CO2 | 12 |
| b. | List the different types of slope failures. Give the factor of safety used in the stability of slopes. | CO2 | 8 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Derive an expression for the vertical stress at a point due to a point load, using Boussinesq’s theory. | CO2 | 6 |
| b. | Discuss the basis of the construction of Newmark’s influence chart. How it is used? | CO2 | 10 |
| c. | Determine the vertical stress at a point P which is 3m below and at a radial distance of 3m from the vertical load of 1000kN. Use Wastergaard’s solution.(ν = 0.0) | CO2 | 4 |