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



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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **17CE2007** | **Duration :** | **3hrs** |
| **Sub. Name :** | **SOIL MECHANICS** | **Max. Marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain the three phase diagram for partially saturated soil, fully saturated soil and dry soil with neat sketch. | CO1 | 5 |
| b. | A sample of soil has a water content of 40%. If the specific gravity of solids is 2.67, examine the void ratio, saturated density and submerged density. | CO1 | 5 |
| c. | A sample of saturated soil has a water content of 25% and a bulk unit weight of 20kN/m3. Investigate the dry density, void ratio and specific gravity of solid particles. What would be the bulk unit weight of the same soil at the same void ratio but at a degree of saturation of 80% ? Take γ‑w = 10kN/m3. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Demonstrate the experimental procedure for the determination of shrinkage limit of a soil. | CO2 | 5 |
| b. | One kg of soil was sieved through a set of 8 sieves, with the size 4.75mm, 2.0mm, 600µ, 425µ, 300µ, 212µ, 150 µ and 75µ. The mass of soil retained on these sieves was found to be 50, 78, 90, 150, 160, 132, 148, and 179gm respectively. Draw the particle distribution curve and hence determine the uniformity coefficient and coefficient of curvature. | CO2 | 15 |
|  |  |  |  |  |
| 3. | a. | List out the factors affecting the compaction. | CO4 | 5 |
|  | b. | Describe the standard Proctor’s test and the modified Proctor’s test with neat sketch. How would you decide the type of test to be conducted in the laboratory? | CO4 | 15 |
| (OR) | | | | |
| 4. | a. | Interpret the effect of capillary on effective stress on saturated soil. | CO4 | 5 |
|  | b. | A soil profile consists of a surface layer of sand 3.5m thick (γ = 19.6kN/m3), an intermediate layer of clay 3m thick (γ =17.2kN/m3) and the bottom layer of gravel 3.5m thick (γ =18.3/m3). The water table is at the upper surface of clay layer. Determine the effective pressure at various levels immediately after placement of a surcharge load of 86.8kN/m2 to the ground surface. | CO4 | 15 |
|  |  |  |  |  |
| 5. | a. | In a constant head permeameter test the following observation were taken. Distance between piezeometer tappings = 100mm, Quantity of water collected = 350 ml, Duration of test = 270 sec.  Determine the coefficient of permeability. | CO3 | 5 |
|  | b. | Estimate the average coefficient of permeability in the horizontal and vertical direction for a deposit consisting of three layers of thickness 5m, 1m and 2.5m having coefficient of permeability 3x10-2 mm/s, 3x10-5 mm/s, 4x10-2mm/s respectively. Assume the layers are isotropic. | CO3 | 5 |
|  | c. | Demonstrate the Variable head variable method to determine coefficient of permeability with neat sketch. | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | A rectangular foundation 20m x 10m subjects the subgrade to a contact pressure of 250kN/m2. Determine the vertical stress at a point P located at a depth of 5m.  5m  10m  20m  5m  P | CO5 | 10 |
|  | b. | Discuss the basis of the construction of Newmark’s influence chart. How is it used? | CO5 | 10 |
|  |  |  |  |  |
| 7. | a. | A stratum of clay is 2m thick and has an initial overburden pressure of 50kN/m2 at its middle. Calculate the final settlement due to an increase in pressure of 40kN/m2 at the middle of the clay layer. The clay is over consolidated, with an preconsolidation pressure of 75kN/m2. The values of the coefficients of recompression and compression index are 0.05 and 0.25 respectively. Take the initial void ratio as 1.40. | CO4 | 5 |
|  | b. | A 3m thick clay layer beneath a building is overlain by a permeable stratum and is underlain by an impervious rock. The coefficient of consolidation of the clay was found to be 0.025cm2/min. The final expected settlement for the layer is 8cm.  (a) How much time will it take for 80% of the total settlement to take place?  (b) Determine the time required for a settlement of 2.5cm to occur.  (c) Compute the settlement that would occur in one year. | CO4 | 15 |
| (OR) | | | | |
| 8. | a. | Explain the different factor of safety used in the stability of slope? | CO6 | 10 |
|  | b. | Discuss the friction circle method for the stability analysis of slopes. | CO6 | 10 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | 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) | | 1 | 50 | 350 | | 2 | 100 | 440 | | 3 | 150 | 530 | | 4 | 200 | 610 |   Determine the value of the angles of shearing resistance and the cohesion intercept by plotting conventional failure envelope. | CO5 | 10 |
|  | b. | Explain the experimental procedure of unconfined compressive test with neat sketch. | CO5 | 10 |