****Last Date of Submission ……..** **Section CE 31/CE 32**

Babu Banarasi Das -National Institute of Technology & Management, Lucknow
B. Tech Third Year (Fifth Semester) 2018-19
Department of Civil Engineering

Geotechnical Engineering (RCE-501)
Assignment: I (Unit 1)

NOTE-ATTEMPT ALL PARTS

1. Explain the process of soil Formation. Differentiate b/w Residual and a Transported soil.
2. Give the functional R/w B/w Unit Weight and Dry Unit weight and prove
$$\Upsilon_d = \Upsilon / (1+w)$$
3. What are different kinds of soil structures which can occurs in nature? Describe in brief.
4. Establish the following relationship $S = \frac{w}{\frac{\gamma_w}{\gamma}(1+w)-\frac{1}{G}}$
5. A 1000cc core cutter weighing 946.80g was used to find out in-situ unit weight of an embankment. The weight of core cutter filled with soil was noted to be 2770.60g. Laboratory tests on the sample indicated a water content of 10.45% and specific gravity of solids of 2.65. Determine bulk unit weight, dry unit weight, void ratio and degree of saturation of the sample.
6. An undisturbed sample of clay brought from the field was noted to have a volume of 18cc and weight of 30.8g. On oven drying, the weight of sample was reduced to 20.5g. The volume of dried sample as obtained by displacement of mercury was 12.5cc. Calculate shrinkage limit and the specific gravity of solids? What is the shrinkage ratio?
7. Write short notes on: (i) Residual soils (ii) Activity of soils (iii) Corrections in hydrometer
8. What is the purpose of soil classification? Describe the salient features of plasticity chart.
9. How will you determine the liquid limit of a soil?
10. Explain Atterberg limit in detail.

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Assignment: II (Unit I1)

1. In a falling head permeameter test, the initial head is 40cm. The head drops by 5cm in 10mins. Calculate the time required to run the test for the final head to be at 29cm. If the sample is 6cm in height & 50cm^2 in cross sectional area, calculate the coefficient of permeability, taking area of stand pipe = 0.5cm^2.
2. Relate the various methods of determination of coefficient of permeability with the soil types for which they are best suited. How will you find the permeability in lab through falling head permeability test?
3. At a construction site, a 3m thick layer is followed by a 4m thick gravel layer which is resting on impervious rock. A load of 25kN/m^2 is applied suddenly at the surface. The saturated unit weight of the soils is 19kN/m^2 and 20kN/m^2 for the clay and gravel layers respectively. The water table is at the surface. Plot the variation of total, neutral and effective pressures in the layers.
4. Write short notes on: (i) Bulking of sand (ii) Quick sand condition
5. The maximum dry density of a sample by the light compaction test is 1.78g/ml at an optimum water content of 15%. Find the % air voids and degree of saturation. Take G=2.67. What would be the corresponding value of dry density on the zero air void line at O.M.C?
6. Derive the equation for finding the discharge through a unconfined aquifer. Write the assumptions in Dupit's Theory.
7. Explain standard proctor test in detail.
8. Draw the pressure distribution diagram of a submerged soil mass.
9. What is piping in hydraulic structure? Suggest some remedial measures to check and prevent it.
10. Explain field method for compaction in detail.

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Geotechnical Engineering (RCE-501)
Assignment: III (Unit II1)

1. Write short note on two of the following
   (i) Consolidation under construction loading
   (ii) Secondary consolidation
   (iii) Pre consolidation pressure.
2. In a consolidation test, the void ratio of the specimen which was 1.068 under the effective pressure was increased to 429kN/m^2. Calculate a) coefficient of compressibility b) compression index c) coefficient of volume change. Find the settlement of foundation resting on above type of clay, if thickness of layer is 8m and the increase in pressure is 10kN/m^2.
3. Write the assumptions and limitations of Bossinesq theory used for determining vertical stresses under point loads.
   The base of a tower consists of an equilateral triangle frame, on the corners of which the three legs of the tower is supported. The total weight of tower is 600kN, which is equally carried by all three legs. Compute the increase in vertical stress in the soil at a point 5m below one of the legs.
4. Give the assumptions of Terzaghi's Theory for calculating the rate of 1-D consolidation and prove its expression.
5. What is a flow net? Give it properties.
6. How will you determine a phreatic line in an earthen dam?
7. Explain Newmark's Influence chart.
8. With the help of a proper diagram, show the pressure distribution diagram due to a point load on the ground.
9. What is effective stress? How will you determine effective stress below G.W.T.?
10. Explain various types of settlement which may occur in soil.

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Geotechnical Engineering (RCE-501)
Assignment: IV (Unit 1V)

1. What are the advantages and disadvantages of a tri-axial compression test?
2. Explain the curves between the deviator stress versus axial strain and variation of pore water pressure versus axial strain for loose and dense sand both. A CU test was conducted on a soil sample with cell pressure 100kN/m2. The deviator stress at failure was 60kN/m^2. The soil have a cohesion c'=0 and $\phi=30^0$ and Cu=0 and ϕ_u=13.3. What was the pore water pressure at failure?
3. A retaining wall 10m high retains a cohesionless soil with an angle of internal friction 35^0. The surface is level with the top of the wall. The unit weight of the top 3m of the fill is 1.6t/m^3 and that of the rest is 2t/m^3. Find the magnitude and application of the result active thrust.
4. Write the assumptions in Rankine's Theory.
5. What are the Skempton's pore pressure parameters? Drive and expression between pore water pressure and applied stresses.
6. How many types of shear test on the basis of drained condition? Explain all in brief. Also show the curve between
   (i) Volume change Vs Shear strain
   (ii) Deviator stress Vs Axial strain
   (iii) Pore water pressure Vs axial strain.

   For both loose and dense sand.
7. Compare Rankine and Coloumb's theory. A retaining wall 4m high supports a backfill (C=20 kN/m2, φ=300, γ=20kN/m^3) with horizontal top, flush with the top of the wall. The backfill carries a surcharge of 20kN/m^2. If the wall is pushed towards the backfill, compute the total passive pressure on the wall and its point of application.
8. Explain Mohr-coulomb theory envelope.
9. Explain various method of determining shear strength in laboratory.
10. Explain active and passive earth pressure.

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Geotechnical Engineering (RCE-501)

Assignment: V (Unit V)

1. How will you calculate the bearing capacity as per Indian standard method?
2. Show and explain the effect of water table on bearing capacity equation given Terzaghi's.
3. What are the basic modes of failure of an earth slope? Briefly outline the remedial measure that can be undertaken against failure of slope.
4. Determine the ultimate bearing capacity of a strip footing 2m in width, with its base at a depth of 1.5m below the ground surface and resting on a saturated clay soil with the following properties: ysat=20kN/m3 , cu=40kN/m2 , ϕu=0, c'=10kN/m2 , ϕ=200. For ϕ=200, Nc=17.7, Nq=7.4 , Ny=5.0 . The natural water table is 1m depth below the ground level. Ignore depth factors.
5. What are the methods available for soil stabilization? Describe its use for highway project.
6. Calculate the net ultimate bearing capacity of rectangular footing 2mx4m in plan, founded at a depth of 21.5m below the ground surface. The load on the footing acts at an angle 150 to the vertical and is eccentric in the direction of width by 15cm. The saturated unit weight of the soil is 18kN/m^3. The rate of loading is slow and hence the effective stress shear strength parameters can be used in the analysis. C=15kN/m^2, ϕ=25^0, natural water table is 2m below the ground surface. Use IS recommendations for the bearing capacity of shallow foundations. For ϕ=25^0, Nc=20.7, Nq=10.7 and Ny=10.9.
7. Explain SPT test in detail.
8. What is inside & outside clearance in soil exploration?
9. What do you mean by site investigation?
10. What are different purposes for which site investigation is done?