Roll No .....

# CE - 604

## B.E. VI Semester

Examination, June 2015

## Geotechnical Engineering - I

***Time : Three Hours***

***Maximum Marks : 70***

***Note:*** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Discuss three types of structure of soils.

   b) Discuss the three phase system in terms of volume-volume relationships?

   c) A soil has bulk density of 20.1 kN/m$^3$ and water content of 15%. Calculate the water content if the soil partially dried to a density 19.4 kN/m$^3$ and void ratio remains unchanged.

   d) Discuss the laboratory procedure as per IS code to find shrinkage limit of soil?

   OR

   List the different corrections used in hydrometer analysis. Discuss the importance of these corrections.

2. a) Discuss the graphical method to draw flow net.

   b) How to determine coefficient of permeability from falling head method?



   c) Discuss Burmister method to determine pre-consolidation pressure.

   d) What do you understand by critical hydraulic gradient? A ground of sandy layer of 3.5 m thick having dry unit weight is 18.0 kN/m$^3$ and below this sandy layer a clay layer of 3.0 m thick having saturated unit weight is 16.5 kN/m$^3$ are present. Find the total and effective pressure at a depth of 5.0 m below from the top of the ground if the water table 3.5 m below the top of the ground.

OR

How to estimate the coefficient of consolidation by Logarithm of Time Fitting method.

3. a) Draw failure Mohr's envelope for specimens for total stress tested under consolidated drained condition.

   b) How to estimate the shear strength of soil from vane shear test.

   c) A concentrated load of 22.5 kN act on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 15 m and (i) directly under the load, and (ii) at a horizontal distance of 7.5 m. Use Boussinesq's equation.

   d) Discuss the procedure to conduct Box shear test in the laboratory. Discuss the limitations of this test.

OR

Discuss the laboratory procedure to conduct CD test in triaxial apparatus.





4. a) Discuss the relation between shear strength envelope and angle of internal friction for c-phi soil for infinite slope.

   b) Which types of two factor of safety are normally used for the stability analysis of slopes? Explain in details.

   c) Discuss the term Taylor's stability number. How to estimate the factor of safety of slope using stability chart and explain it with an example.

   d) List the different methods of stability analysis. Describe the friction circle method for stability analysis.

OR

An embankment is inclined at an angle of 35° and its height is 15 m. The angle of shear resistances is 15° and cohesion intercept is 200 k$N$/m$^2$. The unit weight of soil is 18.0 kN/m$^3$. If Taylor's stability number is 0.06, find the factor of safety with respect to cohesion.

5. a) Discuss the meaning of arching of soil.

   b) Discuss the meaning of reinforced earth retaining structure.

   c) List the assumptions in Coulomb's theory.

   d) A cantilever retaining wall of 7 m height retains sand. Determine active earth pressure at the base using Rankine's theory when the backfill is (i) dry and (ii) saturated. The properties of sand are: void ratio = 0.5, phi = 30° and G = 2.7.

OR

A retailing wall with a vertical backfill of height 7.0 m support cohesion-less soils of density 17.32 kN/m$^3$, and phi = 30°. The surface of the soil is horizontal. Find the magnitude and direction of thrust per metre of wall by Rankine's theory.

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