



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 100501

Roll No.

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B. Tech.

(SEM. V) (ODD SEM.) THEORY
EXAMINATION, 2014-15

GEOTECHNICAL ENGINEERING

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Attempt all questions.
 - (2) All questions carry equal marks.
 - (3) If required any missing data; then choose suitably.

1 Attempt any **FOUR** parts of the following : **5x4=20**

- (a) Write a brief note on the soil formation. What are the building blocks of clay minerals? Explain the three common groups of clay minerals.
- (b) Discuss various field and laboratory methods of water content determination of soils.
- (c) Explain the following :
 - (i) Thixotropy of clays
 - (ii) Corrections in hydrometer analysis.

(d) Derive the functional relationship between γ_d ,

$$\gamma_w, n_a, W \text{ and } G; \gamma_d = \frac{(1-n_a)G\gamma_w}{1+WG}$$

(e) A soil sample has 97% of the particles (by weight) finer than 1mm, 58% finer than 0.1 mm, 25% finer than 0.01 mm and 12% finer than 0.001mm. Draw the grain size distribution curve and determine the following :

Percentages of gravel, coarse sand, medium sand, fine sand and silt as per IS soil classification system. Also determine C_u and C_c .

(f) A soil sample assumed to consist of spherical grains all of same diameter will have maximum void ratio when the grains are arranged in a cubical array. Find the void ratio and dry unit weight. Take unit weight of grains as 20 kN/m³.

2 Attempt any **four** parts of the following : **5x4=20**

(a) The difference in values of capillary rise for fine sand and silt was found to be 4.5 m. If the capillary rise in fine sand is 0.5 m. Compute the difference in size of voids of the two soils.

(c) A rectangular footing of 2.4 m × 3.5 m size is to be constructed at 1.5 m below the ground level in a $c-\phi$ soil having the following properties : $C=1.0$ t/m², $\phi=20^\circ$ and $\gamma=1.75$ t/m³.

The footing has to carry a gross vertical load of 70 t, inclusive of its self - weight. In addition, the column is subjected to a horizontal load of 11 t applied at a height of 3.3 m above the base of footing. Determine the factor of safety of the footing against shear failure as per IS : 6403-1981.