

Total Pages—6

B.Tech-5
GTE-I

Set-2

Full Marks : 70

Time : 3 hours

Answer Q. No. 1 which is compulsory and
any five from the rest

The figures in the right-hand margin indicate marks

1. Answer the following questions : 2 × 10

(a) The sensitivity of a soft clay cannot be less than unity. True or false ? Explain your answer.

(b) A clay sample has a void ratio of 0.53 in dry state. What will be its shrinkage limit if $G = 2.70$?

(c) Explain how the value of coefficient of permeability is determined in case of stratified soil.

(d) A soil sample compacted according to the standard proctor test has a density of 2100 kg/m^3 at 100% compaction and at the o.m.c. of 14%, what is its dry density ?

(Turn Over)

(2)

- (e) Define and explain – Time factor and Degree of consolidation.
 - (f) Explain the terms C-U and C-D tests with reference to shear strength of soil.
 - (g) Define critical void ratio for sand and explain its significance.
 - (h) Show the structure of montmorillonite clay mineral.
 - (i) What is adsorbed water ?
 - (j) What do you mean by degree of compaction in the field ?
2. 500 gm of dry soil was subjected to a sieve analysis. The weight of soil retained on each sieve is as follows :

<u>I.S. sieve</u> <u>size</u>	<u>wt. of soil</u> <u>(gm)</u>	<u>I.S. sieve</u> <u>size</u>	<u>wt. of soil</u> <u>(gm)</u>
4.75 mm	10		
2.00 mm	165	212 μ	40
1.00 mm	100	150 μ	30
425 μ	85	75 μ	50

(3)

Plot the grain size distribution curve and determine the following :

- (i) Percentage of gravel, coarse sand, medium sand, fine sand and silt-clay fraction in the soil as per Indian standards.
- (ii) Effective size
- (iii) Uniformity coefficient
- (iv) Coefficient of curvature
- (v) The gradation of the soil. 10

3. (a) Determine the maximum yield from a well driven into an unconfined aquifer. The following data are given :

Maximum drawdown = 4.5 m, Radius of the well = 200 mm, Depth of water table = 8 m, coefficient of permeability = 0.8 mm/sec. 5

- (b) Explain the laboratory method of determination of coefficient of permeability in case of clay. 5

4. (a) A clay stratum of 8.0 m thick is located at a depth of 6 m from ground surface. The natural moisture content of the clay is 56%

(4)

and $G = 2.75$. The soil strata between the ground surface and clay consists of fine sand. The water table is located at a depth of 2 m below the ground surface. The submerged weight of fine sand is 10.5 kN/m^3 , and its moist unit weight above the water table is 18.69 kN/m^3 , calculate the effective stress at the centre of the clay layer. 5

(b) Prove that capillary phenomenon increases effective stress in a soil mass. 5

5. (a) The soil from a borrow area having an average in situ unit weight of 15.5 kN/m^3 and water content of 10%, was used for the construction of an embankment (total finished volume 6000 m^3). In half of embankment, due to improper control during rolling, the dry unit weight achieved was slightly lower. If the dry unit weight in the two parts is 16.5 and 16.0 kN/m^3 . Find the volume of borrow area soil used in each part and the amount of soil used. 5

(b) Explain the principles and methods involved in soil compaction. 5

(5)

6. (a) Explain and differentiate between compressibility, compaction and consolidation in reference to soil strata. 4
- (b) The coading period for a building extended from July 2007 to July 2009. In July 2012 the average measured settlement was found to be 113 mm. It is known that the ultimate settlement will be about 360 mm. Estimate the settlement in July 2017. Assume double drainage to occur. 6
7. (a) Discuss the effects of drainage conditions on shear strength parameters of a dry soil. 4
- (b) A standard specimen of cohesionless sand was tested in triaxial compression and the sample failed at a deviator stress of 482 kN/m^2 when the cell pressure was 100 kN/m^2 ; under drained conditions. Find the effective angle of shearing resistance of sand. What would be the deviator stress and major principal stress for another identical specimen of sand if it is tested under a cell pressure of 200 kN/m^2 ? 6

(6)

8. (a) What basic principles are involved in soil improvement methods? What alternate remedies are available to soil stabilisation methods? 5
- (b) Explain stabilisation of soil with lime. 5
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