Code No: R1632012 **R16** SET - 1

III B. Tech II Semester Supplementary Examinations, November – 2019

GEOTECHNICAL ENGINEERING – I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Briefly explain about diffused double layer. [3M]
   b) What are the various sieve sizes? [2M]
   c) State Darcy's law. Define hydraulic gradient. [2M]
   d) Mention any four assumptions of Boussinesq's theory. [2M]
   e) Differentiate between over-consolidated and normally-consolidated clays. [2M]
   f) What are the different types of laboratory shear strength tests? [3M]

PART –B (56 Marks)

2. a) Explain the procedure of the Standard Proctor's test. [7M]
   b) A loose uncompacted sand fill has a relative density of 40%. Laboratory tests indicated that the Minimum and maximum void ratios of sand are 0.56 and 0.9 respectively. Specific gravity is 2.65. What is the field dry unit weight of sand? [7M]

3. a) Draw the grain size distribution curve of a well graded soil. [7M]
   b) Given below is the grain size analysis of an inorganic soil. [7M]

Sieve size in mm	4.75	2.40	1.20	0.60	0.425	0.075
%fines	100	90	64	38	18	13

For this soil, LL=38% and PL=19%. Classify the soil according to Indian standard system.

4. a) Derive equations for average permeability for flow parallel and perpendicular to bedding planes. [7M]
   b) Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of three layers of thickness in 5 m, 1 m and 2.5 m and having coefficient of permeability of 3×10^{-2} mm/sec, 3×10^{-5} mm/sec and 4×10^{-2} mm/sec respectively. Assume the layers are Isotropic. [7M]

5. a) Differentiate between Boussinesq's and Westergaard's theory. [7M]
   b) A concentrated load of 1000 kN is applied at the ground surface. Determine the vertical stress at a point 'P' which is 5m directly below the load. Also calculate the vertical stress at a point 'R' which is at a depth of 5 m but at a horizontal distance of 3 m from the axis of the load. Use Westergaard's theory (Poisson's ratio=0). [7M]

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6. a) Describe spring analogy of one-dimensional consolidation with a neat sketch. [7M]

b) An area is underlain by a stratum of clay layer 10 m thick. The layer is doubly drained and has the coefficient of consolidation of 0.4 m^2/month. How long would it take for a surcharge load to cause a settlement of 40 cm if the same load causes a final settlement of 60 cm? [7M]

7. a) The results of two CU triaxial tests on saturated clay are given as [7M]

Specimen	All round pressure (kPa)	Additional axial stress (kPa)	Pore pressure at failure(kPa)
I	**250**	**152**	**120**
II	**500**	**300**	**250**

Determine C^1 and ϕ^1 analytically.

b) Explain Direct Shear Test in detail. [7M]

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