Code No: RT31011 **R13** SET - 1

III B. Tech I Semester Supplementary Examinations, May -2018

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. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1 a) Define texture of a soil. [3M]
b) Write the equation of the A-line, and explain the terms in it. [4M]
c) What is an equipotential line and a flow line? [4M]
d) A point load of 100 kN is applied at the ground surface. What is the value of vertical stress at a depth of 3 m and 2 m radially from the point of application? [4M]
e) Write the relationship between coefficient of permeability, coefficient of consolidation and unit weight of water. [3M]
f) Define critical void ratio. [4M]

PART –B

2 a) Derive the relationship between bulk density, degree of saturation and void ratio of a soil. [8M]
b) A dry soil has a void ratio of 0.65 and its grain specific gravity is = 2.80. What is its unit weight? Water is added to the sample so that its degree of saturation is 60% without any change in void ratio. Determine the water content and unit weight. The sample is next placed below water. Determine the true unit weight (not considering buoyancy) if the degree of saturation is 95% and 100% respectively. [8M]

3 a) Explain the procedure to conduct the hydrometer test on a soil sample in the lab. [8M]
b) Dry soil with G= 2.71 is mixed with 16% by weight of water and compacted to produce a cylindrical sample of 38 mm diameter and 76mm long with 6% air content. Calculate the mass of the mixed soil that will be required and the void ratio of the sample. [8M]

4 a) Derive the expression to determine the capillary rise in a soil deposit. [8M]
b) A uniform soil deposit has a void ratio 0.60 and specific gravity of 2.65. The natural ground water is at 2.50 m below natural ground level. Due to capillary moisture, the average degree of saturation above ground water table is 50%. Determine the neutral pressure, total pressure and effective pressure at a depth of 6.0 m. Draw a neat sketch. [8M]

5 a) Compare and contrast Boussinesq's and Westergaard's theories? [8M]
b) A strip load of considerable length and 1.50 m width transmits a pressure of 150 kN/m^2 to the underlying soil. Determine the maximum principal stress at 0.75 m depth below the footing, if the point lies (i) directly below the centre of the footing, and (ii) directly below the edge of the footing. [8M]
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6 a) Explain the Spring Analogy concept of consolidation, with neat sketches? [8M]

b) The void ratio of clay A decreased from 0.572 to 0.505 under a change in pressure from 1.20 kPa to 1.80 kPa. The void ratio of clay B decreased from 0.612 to 0.597 under the same increment of pressure. The thickness of sample A was 1.50 times that of B. Nevertheless the time required for 50% consolidation was three times longer for sample B than for sample A. What is the ratio of the coefficient of permeability of A to that of B? [8M]

7 a) Explain the three standard triaxial shear tests with respect to drainage conditions? [8M]

b) The following data relate to a triaxial compression tests performed on a soil sample: [8M]

Test No.	Chamber pressure (kPa)	Maximum deviator stress (kPa)	Pore pressure at maximum deviator stress (kPa)
1.	80	175	45
2.	150	240	50
3.	210	300	60

Determine the effective shear strength parameters of the soil, **graphically only.**

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