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ONE TIME EXIT SCHEME

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10CV54

Fifth Semester B.E. Degree Examination, April 2018
Geotechnical Engineering – I

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing data, if any, may be suitably assumed.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Define the following :
i) Void ratio
ii) Water content
iii) Degree of saturation. **(06 Marks)**

b. Starting from 3 – phase diagram, with usual notations prove that :

$$\gamma_b = \frac{(G + S_r e)}{(1 + e)}\gamma_w .$$ **(06 Marks)**

c. For a given sandy soil, e_{max} = 0.82 and e_{min} = 0.42. Let G = 2.66, in the field, the soil is compacted to a moist unit of 16.87 kN/m^3 at a moisture content of 9%. Determine void ratio, porosity, degree of saturation and relative density. **(08 Marks)**

2 a. List the various index properties and explain briefly determination of any one in the laboratory. **(06 Marks)**

b. With the help of particle size distribution curves explain well graded, uniformly graded, fine grained and coarse grained soils. **(06 Marks)**

c. In a specific gravity test, the following observations were made.
Weight of dry soil = 103g
Weight of density bottle + soil + water = 538g
Weight of density bottle + water = 474.6g
What is the specific gravity of soil solids? Later it has been found that 2.5ml of air remained entrapped in the soil sample during determination of weight of density bottle + soil + water. what is the percentage error in calculating G. **(08 Marks)**

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3 a. Draw a neat sketch of plasticity chart by marking various salient points. Using the above chart and the following data classify the soils as per IS 1498 – 1970. **(10 Marks)**

Soil	Gravel%	Sand %	Finer%	C_u	C_C	Liquid limit (%)	Plastic limit (%)
A	01	96	03	7.0	1.5	–	–
B	00	04	96	–	–	60	25
C	01	02	97	–	–	30	24

b. With the help of neat sketches explain principle clay minerals kaolinite, montmorillonite and Illite. **(10 Marks)**

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4 a. Explain the following :
   i) Superficial velocity
   ii) Seepage velocity. **(04 Marks)**

b. Explain briefly factors affecting permeability. **(06 Marks)**

c. In a falling head permeability test, the soil sample used is 20 cm long with a cross-sectional area 24 cm^2. Calculate the time required for the head causing flow to drop from 250mm to 120mm. The cross-sectional area of the stand pipe is $2cm^2$. The soil sample is made up of 3 layers. The thickness of first layer from the top is 8cm and has a value of K as 2×10^{-4} cm/s. The second layer has thickness of 7cm and it has $K = 5 \times 10^{-4}$cm/s. The bottom most layer has a K value of 7×10^{-4}cm/s. Flow is in a direction perpendicular to the layers. **(10 Marks)**

PART – B

5 a. Explain total, neutral and effective stresses in soil. What is the significance of effective stress? **(06 Marks)**

b. Explain Mohr's – coulomb failure theory of soils. **(06 Marks)**

c. The direct shear test conducted on a soil specimens gives the following results at failure :

Test No.	Normal stress kN/m^2	Shear Stress kN/m^2
1	100	50
2	150	70
3	200	90

Draw the failure envelope. Determine shear strength parameters and for any one failure point determine principal stresses and planes. **(08 Marks)**

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6 a. What is compaction? What are the compaction characteristics? Explain any two factors affecting compaction. **(08 Marks)**

b. The following results refers to compaction test as per IS light compaction :

Water content (%)	85	12.2	13.75	15.5	18.2	20.2
Wt. of wet sample (kg)	1.8	1.94	2.00	2.05	2.03	1.98

If the volume of compaction mould is 1000 cc and specific gravity of soil is 2.7.
   i) Plot the compaction curve and obtain the maximum dry unit weight and optimum moisture content.
   ii) Plot the 100 percent saturation line
   iii) If it is proposed to secure a relative compaction of 95 per cent in the field, what is the range of water content that can be allowed? **(12 Marks)**

7 a. Distinguish between normally and over consolidated soils. **(04 Marks)**

b. Explain the significance of pre-consolidation pressure. Describe the casagrande method of determining it. **(08 Marks)**

c. In a consolidation test void ratio decreased from 0.70 to 0.60, when the pressure changed from $50kN/m^2$ to $100kN/m^2$. Determine : i) Compression index ii) coefficient of compressibility iii) coefficient of volume change. **(08 Marks)**

8 a. Differentiate compaction from consolidation. **(06 Marks)**

b. How are shear tests classified based on drainage conditions? Under what conditions, each one of these texts are preferred. **(06 Marks)**

c. In a drained triaxial compression test, a saturated sand sample failed at a deviator stress of $360kN/m^2$ under a cell pressure of $100 kN/m^2$. Find the effective shear parameters of sand if another identical sample is tested under a cell pressure of $200kN/m^2$. Determine the deviator stress at which the specimen fails. **(08 Marks)**

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