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10CV54

Fifth Semester B.E. Degree Examination, June/July 2016
Geotechnical Engineering - I

Time: 3 hrs. Max. Marks:100

Note: ***1.Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2.Assume missing data if any, suitably.

PART – A

1 a. Critically define the terms void ratio, porosity and water content with phase diagram. **(04 Marks)**

b. Derive the relation $\gamma_d = \frac{G.\gamma_w}{1+e}$ with usual notations. **(06 Marks)**

c. In an earthen embankment under construction, the bulk unit weight is 16.5kN/m^3 at water content 11%. If the water content has to be increased to 50%, compute the quantity of water to be added per cubic meter of soil. Assume no change in void ratio. Also determine 'e' at this water content taking G = 2.65. **(10 Marks)**

2 a. Define relative density of sand and list its importance in geotechnical engineering. **(04 Marks)**

b. Describe consistency of soil. List and define consistency limits. **(06 Marks)**

c. The following results are obtained by conducting liquid limit test on clayey soil in the laboratory : **(10 Marks)**

No. of blows (N) :	34	23	18	12
Water content (W%) :	44.6	49.4	51.4	55.6

Plot flow curve. Determine Liquid limit, Toughness index. Assume plastic limit = 20%.

3 a. Explain with the help of typical particle size distribution curve, well graded, poorly graded and gap graded soil. **(04 Marks)**

b. With the neat sketch, explain structure of clay minerals. **(06 Marks)**

c. Following results are obtained from the laboratory tests conducted on two soil samples : **(10 Marks)**

Soil sample	A	B
Liquid limit :	85%	45%
Plastic limit :	50%	12%

Show the positions of these soils on plasticity chart and classify as per I.S. system.

4 a. Derive the relation between co-efficient of permeability and percolation with usual notations. **(07 Marks)**

b. Explain Quick – sand phenomena and list its importance during construction. **(05 Marks)**

c. A falling head permeater accommodates a soil sample of 6cm length and 500cm^2 in area. The permeability of sample is expected to be 1×10^{-4} cm/sec. Head of water in the standpipe falls from 30cm to 10cm in 40 minutes. Determine the size of the stand pipe which should be used. **(08 Marks)**

PART – B

5 a. Explain sensitivity and thixotropy of clayey soil. **(04 Marks)**

b. List the factors affecting shear strength of soil. **(04 Marks)**

c. A direct shear test results are obtained as follows :

Normal stress (kN/m^2) :	100	200	300
Shear stress (kN/m^2) :	130	185	240

Determine shear parameters graphically. Also draw Mohr's circle corresponding to second test result and report major and minor principal stresses. **(12 Marks)**

6 a. List the factors affecting compaction of soil and explain any 2 in detail. **(05 Marks)**

b. List and explain various types of field compaction equipments. **(05 Marks)**

c. The results of standard compaction test conducted in the laboratory are tabulated as follows:

Water content % :	5.00	10.00	14.00	20.00	25.00
Bulk density kN/m^3 :	17.70	19.80	21.00	21.80	21.60

Find MDD and OMC with usual notations by plotting compaction curve. Also draw ZAVD – line assuming G = 2.65. **(10 Marks)**

7 a. State the assumptions of one – dimensional Terzaghi's theory of consolidation. Also write standard / general differential one – dimensional consolidation equation with usual notation. **(08 Marks)**

b. Explain with neat sketch, determination of co-efficient of consolidation by square – root of time fitting method. **(06 Marks)**

c. A layer of soft clay is 6m thick and lies under newly constructed building. The weight of sand overlying the clayey layer produces a pressure of 260 kN/m^2 and this new construction increases the pressure by 100kN/m^2. If the compression index is 0.5, compute settlement of soil layer given water content 40% and G = 2.65. **(06 Marks)**

8 a. Critically discuss limitations of direct shear test. **(04 Marks)**

b. Explain Vane shear test with neat sketch along with relations. **(06 Marks)**

c. A vane apparatus 10cm long and 8cm in diameter was passed into the soft clay, at the bottom of borehole test. A torque of 45N-m was applied at which failure took place. Subsequently, vane instrument rotated rapidly, so as to get remolded soil sample. This remolded soil was sheared at a torque of 18 N-m. Then calculate sensitivity of clayey soil. **(10 Marks)**

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