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10CV54

Fifth Semester B.E. Degree Examination, June/July 2017
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.

PART – A

1 a. Define 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 weight 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. What are index properties? List various index properties. **(06 Marks)**

b. With the help of particle size distribution curves, explain well graded, poorly graded, fine gained and coarse grained soils. **(08 Marks)**

c. A pycnometer test for the determination of water content of a soil sample, having G = 2.70, yielded the following data : weight of moist soil mass = 230.75g
Weight of pycnometer + soil + water = 3092.85g
Weight of pycnometer full of water = 2965.2g
Calculate the water content of the soil. **(06 Marks)**

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

Soil	W_L	W_p	% passing 75 μ IS sieve	% gravel	%sand	C_u	C_c
A	400	45	100	0	0	–	–
B	40	20	70	10	20	–	–
C	40	20	20	20	60	7	2
D	Non plastic	Non plastic	10	10	80	5.0	1.0

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

4 a. What is permeability of soil? Briefly explain the factors affecting permeability. **(06 Marks)**

b. Explain the suitability of variable head permeameter test and also derive the expression used to find the coefficient of permeability. **(06 Marks)**

c. For a field pumping test a well was sunk through a horizontal stratum of sand 14.5m thick underlayed by a clayey stratum. Two observation wells were sunk at horizontal distances of 16m and 34m respectively from the pumping well. The initial position of water table was 2.2m below ground level. At a steady state of pumping rate is 925 lit/min, the draw downs in the observation wells were found to be 2.45m and 1.20m respectively. Show the arrangement in a diagram and determine the co-efficient of permeability. **(08 Marks)**

PART – B

5 a. List the factors affecting shear strength of soils. **(04 Marks)**

b. Explain Mohr-coulomb theory of shear strength. **(06 Marks)**

c. Compute the shear strength of soil along a horizontal plane at a depth of 5m in a deposit of sand having the following particulars.
Angle of internal friction, $\phi = 36°$
Dry unit weight, $\gamma_d = 17\ kN/m^3$
Specific gravity, $G = 2.7$
Assume the ground water table is at a depth of 2.4m from the ground level. Also determine change in shear strength if water table rises upto ground level. **(10 Marks)**

6 a. What do you understand by field control of compaction? Explain proctor needle method. **(08 Marks)**

b. Following are the observations of a compaction test :

Water content (%)	7.7	11.5	14.6	17.5	19.5	21.2
Weight of wet soil (N)	16.67	18.54	19.92	19.52	19.23	18.83

If the volume of compaction mould is 950CC, assume G = 2.65
i) Draw the compaction curve
ii) Report the maximum dry unit weight and optimum moisture content
iii) Draw 100% saturation line. **(12 Marks)**

7 a. Explain spring analogy of consolidation of soils. **(06 Marks)**

b. Explain normally consolidated, under consolidated and over consolidated soils. **(06 Marks)**

c. In a consolidation test void ratio decreased from 0.70 to 0.60, when the pressure changed from 50 kN/m^2 to 100 kN/m2. Determine :
i) Compression index
ii) Coefficient of compressibility
iii) Coefficient of volume change. **(08 Marks)**

8 a. Write the advantages and disadvantages of direct shear test. **(04 Marks)**

b. Briefly explain different drainage conditions in triaxial test in laboratory and how these simulates field problems. **(06 Marks)**

c. In a drained triaxial compression test, a saturated sand sample failed at a deviator stress of 360 kN/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 200 kN/m^2. Determine the deviator stress at which the specimen fails. **(10 Marks)**

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