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T.E. (Civil) (Semester - V) Examination, May - 2016
GEOTECHNICAL ENGINEERING - I (Revised)
Sub. Code : 66238

Day and Date : Tuesday, 03 - 05 - 2016 **Total Marks : 100**

Time : 10.30 a.m. to 01.30 p.m.

Instructions:
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Make assumptions wherever necessary.**
4) **Use of non-programmable calculator is allowed.**

SECTION - I

Q1) Solve any three from following **[18]**

a) List and explain different forms of soil water system in block diagram.

b) Derive the relation for bulk unit weight of soil in terms of Sp. Gravity of soil solids, degree of saturation, void ratio, water content and unit weight of water.

c) The in situ % voids of a sand deposit is 34 % For determining the density index, dried sand from the stratum was first filled loosely in a 1000 cu cm mould and then was vibrated to give a maximum density. The loose dry mass in the mould was 1610 gm and the dense dry mass at maximum compaction was found to be 1980 gm. Determine the density index if the Sp. Gravity of the sand particles is 2.67

d) 50 gm of oven dried soil passing 75 micron sieve was taken in a hydrometer analysis. The corrected hydrometer reading in 1000 ml soil suspension at 2 minute elapsed time interval was 25.The effective depth corresponding to Rh25 is 12.1 cm. Taking Sp. Gravity 2.7 and coefficient of viscosity of water as 1 centi poise. Calculate Particle size diameter in mm and percentage finer than that particle size.

P.T.O.

Q2) Solve any two from following **[16]**

a) List and Explain factors affecting permeability of soil.

b) The water table in a certain area is at a depth of 4 mt below the ground surface to a depth of 12 mt. The soil consists of very fine sand having an average void ratio of 0.7.Above the water table the sand has an average degree of saturation 50 %. Calculate the total stress, pore pressure and effective pressure on a horizontal plane at a depth of 10 mt below the ground surface.

c) Calculate the coefficient of permeability of a soil sample 6 cm in height and 50 sq. cm in cross sectional area, if quantity of water equal to 430 cc passed down in 10 minutes under an effective constant head of 40 cm. On oven drying, the test specimen weighed 4.98 N. Taking Sp. Gravity 2.65 , calculate the seepage velocity of water during the test.

Q3) Solve any two from following **[16]**

a) Explain field compaction control of embankment of soil. Explain any one method.

b) The following data refers to a compaction test as per standard proctor compaction test.

Water content (%)	8.5	12.2	13.75	15.5	18.2	20.2
Weight of wet sample (N)	17.65	19.03	19.62	20.11	19.91	19.42

If the Sp. Gravity of soil grains was 2.7 and volume of mould was 1000 cc.

i) Plot the compaction curve and obtain maximum dry unit weight and the optimum moisture content.

ii) Plot 80 % and 100 % saturation lines.

c) Following data was obtained from consolidation tests on two specimens A and B.

Pressure (kN/m^2)	A (Equilibrium void ratio)	B (Equilibrium void ratio)
100	0.535	0.630
150	0.480	0.615

The initial thickness of specimen A was 30 mm and that of B was 20 mm. If the time taken for specimen A to reach 50 % degree of consolidation is 1/3 of that required by specimen B to reach the same degree of consolidation. Find the ratio of coefficient of permeability of the two clay specimen.

SECTION - II

Q4) Solve any three from following **[18]**

a) List the assumption of Boussinesq analysis for the pressure distribution in a soil layer.

b) What do you understand by "pressure bulb"? Illustrate with sketches.

c) A strip footing 2 m wide is loaded on the ground surface with a pressure of 150 kN/m^2. A 4 m thick soft clay layer exists at a depth of 10 m below the foundation. Find the average increase in vertical stress at the centre of clay layer below the centre line of the footing. Adopt Boussinesq's theory for strip load.

d) A concentrated load of 800 kN acts at the ground surface. Compute the vertical stresses at 8 m depth 2 m away from the axis. Use Westergaard analysis. Take $\mu = 0.25$.

Q5) Solve any two from following **[16]**

a) Explain the term UU, CU and CD and state the advantages of triaxial test.

b) An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 37.5 mm and was 80 mm long. The load at failure measured by the proving ring was 28 N and the axial deformation of the sample at failure was 13 mm. Determine the unconfined compressive strength and the undrained shear strength of the clay.

c) A consolidation undrained test was conducted on a clay sample and following results were obtained.

Cell pressure (kN/m^2)	200	400	600
Deviator stress at failure(kN/m^2)	118	240	352
Pore water pressure at failure(kN/m^2)	110	220	320

Determine the shear strength parameters with respect to

i) total stresses and

ii) effective stresses.

Q6) Solve any two from following **[16]**

a) What are the different types of earth pressure? Write are the assumptions of Rankine's earth pressure theory.

b) A smooth rigid retaining wall 6 m high carries a uniform surcharge load of 12 kN/m^2. The backfill is clayey sand with following properties:

γ = 16kN/m^3, ϕ = 25°, c = 6.5kN/m^2.

Determine the passive earth pressure and draw the pressure diagram.

c) A counterfort wall of 10 m height retains a non-cohesive backfill. The void ration and angle of internal friction of the backfill respectively are 0.70 and 30° in the looses state and they are 0.40 and 40° in dense state. Calculate active and passive earth pressure for both i.e. loose and dense state. Take specific gravity = 2.7.

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