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Seat No.	
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T.E. (Civil) (Semester-V) (Revised)
Examination, May - 2017
GEOTECHNICAL ENGINEERING-I
Sub. Code : 66238

Day and Date : Thursday, 18-05-2017

Total Marks : 100

Time : 10.00 a.m. to 1.00 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) Explain corrections applied to hydrometer reading in wet mechanical analysis.
 - b) List the methods for determination of Sp. Gravity of soil. Explain any one.
 - c) An undisturbed sample of clay brought from the field was noted to have a volume of 18 cc and weight of 30.8 gm. On oven drying the weight of the sample was reduced to 20.5 gm. The volume of dried sample as obtained by mercury replacement method was 12.5 gm. Calculate shrinkage limit and the Sp. Gravity of solids.
 - d) The minimum and maximum dry unit weights of sandy soil are 14.70 KN/cu mt and 18.60 KN/cu mt respectively. Find the dry unit weight and void ratio in natural state corresponding to 60% density index if Sp. Gravity of soil solids is 2.65.

- Q2) a) Derive equation of seepage pressure in terms of coefficient of permeability, hydraulic head causing flow and flow net characteristics. [8]**

OR

- a) List laboratory methods for determination of coefficient of permeability explain in one with figure. [8]
- b) Calculate the horizontal and vertical permabilities of a soil deposit consisting of three layers 150 cm, 180 cm, 200, thick with permabilities 10^{-4} , 10^{-7} , 10^{-9} m/s respectively. [8]

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Q3) a) List field compaction control methods and explain any one. [8]

OR

- a) Explain
- i) Zero air void line or curve [8]
 - ii) Pre Consolidation pressure
- b) A soil sample 20 mm thick take 20 minutes to reach 20% consolidation. Find the time taken for a clay 6 mt thick to reach 40% consolidation. Double drainage was in both the cases. [8]

SECTION-II

Q4) Solve any three from following. [18]

- a) Derive an expression for Boussinesq's equation for vertical stress due to point load.
- b) Explain Westerguards theory in brief.
- c) A concentrated load of 300 kN is applied at the ground surface. Determine the vertical stress at a point Q which is 6 m directly below it. Also compute the vertical stress at appoint R which is at depth 6 m but at a horizontal distance of 5 m from the load axis. Use Boussinesq's equation.
- d) Prove that stresses below the point load as calculated by Westerguards and Boussinesq's theory are in the ration of 1:1.5 approximately.

Q5) Solve any two from following. [16]

- a) Explain different drainage conditions for determination of shear strength parameters.
- b) Direct shear test conducted on a dry, sandy soil. The size of the specimen was 60 mm x 60mm x 25 mm. Tests result were as given in the following table:

Test No.	Normal force (N)	Shear force at failure (N)
1	90	54
2	135	82
3	315	189
4	450	270

Find shear strength parameters.

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- c) The results obtained from a series of CU tests on a soil gave the following results:

$$c_{CU} = c'_{CU} = 0 \text{ and } \Phi_{CU} = 15^\circ ; \Phi'_{CU} = 30^\circ$$

A sample of this soil was tested in a CU test under cell pressure of 150 kN/m². Determine

- i) Deviator stress at failure
- ii) Pore water pressure at failure

Q6) Solve any two from following.

[16]

- a) Explain earth pressure at rest, active earth pressure and passive earth pressure with neat fig.
- b) An unsupported excavation is to be made in a clay layer. If $\gamma = 18 \text{ kN/m}^3$, $c = 18 \text{ kN/m}^2$ and $\phi = 10^\circ$. Calculate the depth of tension cracks and calculate the maxi. possible unsupported depth.
- c) A smooth retaining wall 6 m high retains dry granular backfill weighing 16 kN/m^3 to its level surface. The active thrust on the wall is 96 kN/m of the wall. What will be the total active thrust if the water table comes upto backfill surface? Take specific gravity of backfill = 2.65.

