S – 528

Total No. of Pages : 3

Seat No.	

T.E. (Civil) (Semester - V) Examination, Nov. - 2013

GEOTECHNICAL ENGINEERING - I (New)

Sub. Code : 45537

Day and Date : Friday, 29 - 11 - 2013 **Total Marks : 100**

Time : 2.30 p.m. to 5.30 p.m.

Instructions :

1) **Question 1 from Section - I and question 5 from Section - II are compulsory . Attempt ANY TWO other questions from each of the sections.**
2) **Figures to the right indicate marks.**
3) **ASSUME suitable data if necessary and state the assumption made clearly**
4) **Graph sheets will be provided on request.**
5) **Use of NON-PROGRAMMABLE calculator is allowed.**

SECTION - I

Q1) Answer the following (compulsory) :

a) For a saturated soil whose w=40% & G = 2.71, determine saturated & dry unit weights. **[6]**

b) Define : **[4]**

i) Liquid Limit &

ii) Shrinkage limit

c) What are the uses of flow nets ? **[5]**

d) Differentiate between compaction & consolidation. **[5]**

Q2) a) The water table in a silty-sand deposit, 8m thick, is at a depth of 3m below GL. Sand above WT is saturated by capillarity. γ_{sat} of sand is 19.62 kN/m^3. Calculate effective pressures at 1m, 3m & 8m depths below GL. Plot pressure variations for σ, u & σ'. **[10]**

b) Briefly explain how sieve analysis test is carried out in the laboratory **[5]**

P.T.O.

Q3) a) What do you understand by "uplift pressure" ? **[3]**

b) Plastic limit of a soil is 25% and its lp is 8% . When the dried from its state at plastic limit to dry state the volume change is 25% of its volume at plastic limit. Similarly, the corresponding volume change from its state at liquid limit to dry state is 34% of its volume at liquid limit. Determine shrinkage limit, shrinkage ratio & volumetric shrinkage of the soil. **[12]**

Q4) a) Explain the effects of the following on MDD & OMC with respect to compaction of soil : **[6]**

i) Water content

ii) Amount of compaction

b) An undisturbed sample of clay, 24 mm thick, consolidated 50% in 20 minutes when tested in the laboratory with double drainage. The clay layer, from which the sample was obtained, is 4m thick in the field.

i) How much time [in days] will it take to consolidate 50% in the field with double drainage ?

ii) If the clay layer in the field had only single drainage, calculate the time taken [in days] to consolidate 50%

Assume uniform distribution of consolidation pressure. **[9]**

SECTION - II

Q5) Answer the following (compulsory) :

a) A rectangular footing, 2.4 m × 2.0 m, carries a u. d. I. of 320 kN/m^2. Find the vertical pressure at a depth of 4.2 m below the center of the footing using "Equivalent point load" method. **[5]**

b) Sate ANY THREE limitations and ANY THREE advantages of Direct shear [Box shear] test. **[6]**

c) Draw strength envelopes for : **[4]**

i) ϕ - soil ii) c- ϕ soil

d) Explain what is meant by lateral earth pressure at rest and write the formula for determining the earth pressure at rest at any depth "z" and also the total earth pressure at rest for a retaining wall of height "H". **[5]**

Q6) a) Give the expressions / formula for calculating σ_{x1} σ_{z1} and T_{xz} at a point P situated horizontally at x units away and vertically z units below a line load of intensity Q units per m length. **[6]**

b) What is a pressure bulb ? Briefly explain the procedure of drawing a pressure bulb. **[5]**

c) Compare the vertical pressures at a depth of 2m AND 4m directly beneath a load of 600 kN when :

i) The load is a point load.

ii) The load is a circular load of radius 1.0m. **[4]**

Q7) a) Prove that a failure plane makes an angle, $\alpha_f = (45 + \phi/2)$ **[6]**

b) A specimen of clean dry sand is tested in a shear box. The soil fails at a horizontal stress of 40 kN/m^2 and a normal stress of 50 kN /m^2.

Determine graphically :

i) ϕ value of the sand.

ii) Principal stresses of failure.

iii) Directions of Principal stresses with respect to σ - axis.

Clearly explain the various steps taken by you to arrive at the graphical solution. **[9]**

Q8) a) Differentiate between Active Earth Pressure and Passive Earth Pressure. **[6]**

b) A retaining wall, 4m high, has a smooth back. The backfill has a horizontal surface in level with the top of the wall. There is a uniformly distributed surcharge load of 36 kN/m^2 intensity over the back fill. The unit weight of backfill soil is 18 kN/m^3, $\phi = 30°$ and $c = 0$. Determine magnitude and point of application of the total active earth pressure on the wall. **[9]**

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