ANNA UNIVERSITY: CHENNAI-25

Roll No.									

DEGREE: B.E./B.Tech (Full Time)

BRANCH : Civil Engineering SEMESTER : V

SUBJECT CODE AND SUBJECT : CE 9303 - FOUNDATION ENGINEERING

(REGULATIONS 2008)

Time: 3 hours Max.Marks 100

Instructions : 1. Answer all questions
2. Assume relevant data, if necessary

PART – A (10 X 2 = 20 Marks)

1. If a thin – walled sampler is pushed fast into the following soils, what will be the effect of the disturbance.
(i)Sensitive clay (ii) Sandy silt .
2. List the factors that are to be considered to decide the depth of sub-soil exploration.
3. List the four design requirements of shallow foundations.
4. What is meant by contact pressure? List the factors that affect the contact pressure.
5. What precautions are to be taken while locating a footing (i) on a slope and (ii)adjacent to an existing structures.
6. Why bearing capacity equations for clay usually employ the undrained shear strength.
7. While driving large number of displacement piles for a foundation, how would you proceed? Why?
8. List any four field circumstances, where the phenomenon of down-drag of pile occurs.
9. What is meant by Rankine Passive state? Comment the qualitative degree of shear strength at this state?
10. How do tension cracks influence the distribution of active earth pressure in pure cohesive soil?

PART – B (5 x 16 = 80 Marks)

11(a) (i) What is meant by mat foundation? When they are preferred? Name and sketch the different type of mat foundation? **(6)**

(ii) Proportion a trapezoidal combined footing for two columns 300mm x 300mm carrying column loads of 800kN and 1200kN if the spacing between the column is 4.5m. Take the allowable soil pressure as 250kN/m^2 and length of the footing as 5m. **(10)**

12a. (i) A 1m wide long footing is located at a depth of 1.5m from the ground surface. The supporting soil is compressible and has shear strength parameters, C_{cu}=30kN/m^2 and φ_{cu} = 25°. The total unit weight of the soil, γ = 18.3kN/m^3. The water table is at a greater depth. Compute the safe load that can be carried by the long footing per metre length of the wall. Adopt a factor of safety of 3.0. (10)

For $\phi = 25°$, $N_c = 20.72$, $N_q = 10.66$, $N_\gamma = 10.88$

$\phi = 15°$, $N_c = 10.90$ $N_q = 3.94$, $N_\gamma = 2.65$.

(ii) In a plate load testing using a 305 square plate on a sandy soil under a pressure of 150kN/m^2, a settlement of 8mm was recorded. What should be size of a square footing if the settlement is to be restricted to 25mm? (6)

(OR)

12b. (i) A square footing of 4m width and 0.8m thickness is supported by sand having an average N value of 30. The top of the footing is 1m below the ground surface, and the water table is 1.2m below the base of the footing. Determine the maximum load that the footing can carry if the settlement is not to exceed 15mm. Use I.S. code empirical equation. (6)

(ii)An eccentrically loaded rectangular footing of size 2.5m x 3.5m is placed at a depth of 1m on a stiff saturated clay. The eccentricity is 0.2m in each in each direction. The footing is loaded rapidly and the soil properties are c = 105kN/m^2 and γ = 17.8kN/m^3. Compute the safe net bearing load on the footing if the factor of safety is 3.0. (10)

13a. (i)Draw a neat sketch of 'split spoon sampler' and discuss how the sample is retained in it. (6)

(ii)A seismic refraction survey of an area gave the following data.

(i)Distance from impact point to geophone in m

	15	30	60	80	100
(ii)Time of first arrival in sec.	0.025	0.25	0.10	0.11	0.12

Plot the time travel versus distance and determine velocities of the top and underlying layer of soil. Determine the thickness of the top layer. Using the seismic velocities evaluate the probable earth material in the two layers. (10)

(OR)

13b. A standard penetration test was carried out at a site. The soil profile is shown in fig,13b with the penetration values. The average soil data are given for each layer. Compute the corrected values of N and plot showing the

(i) Variation of observed values with depth

(ii) Variation of corrected values with depth for standard energy 60%

(16)

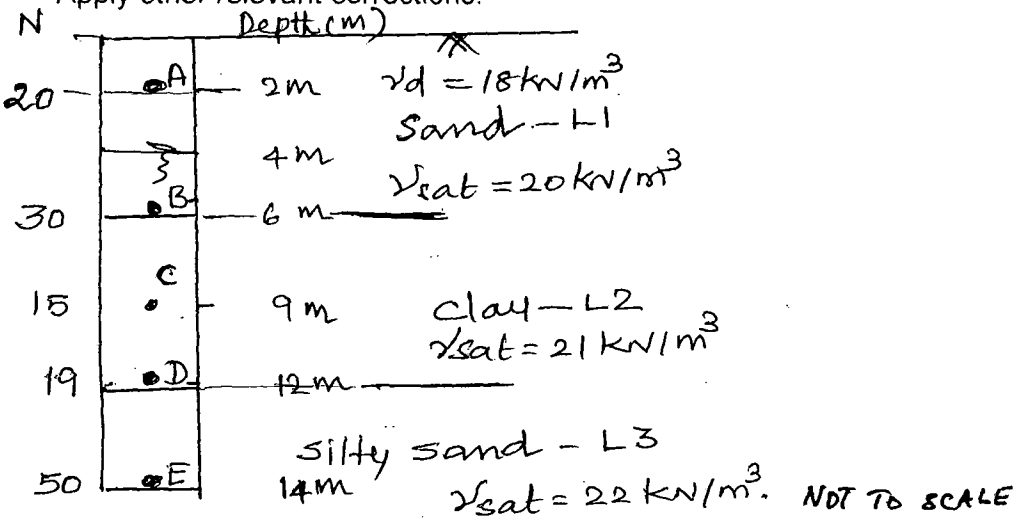
Given: Hammer efficiency - 0.7

Drill rod length correction factor - 0.9

Sampler correction factor - 1.0

Bore hole diameter correction factor - 1.0

Apply other relevant corrections.



14a (i)A 6 m thick layer of medium dense sand overlies a deep dense gravel. Series of SPT were undertaken and the sand stratum showed an average N value of 21. From the tests on gravel, the N-value at the interface has been interpolated as 42. A circular pile of 250mm diameter is to be driven down through the sand gravel to give adequate end bearing. Taking a factor of safety of 3, determine the allowable load that the pile can carry? **(8)**

(ii)In a two layered cohesive soil, bored piles of 400mm are installed. The top layer has a thickness of 5m and bottom one is of considerable depth. The shear strength of the top clay layer is45kN/m^2 and that of the bottom is 100kN/m^2. Determine the length of the bored pile required of carry a safe load of 380kN allowing a factor of safety of 2.0. **(8)**

(OR)

14b. (i)A pile load test is conducted on a 300mm diameter test pile and the following data are obtained.

Load (kN)	0	300	600	900	1200	1500	1800
Settlement (mm)	0	1.25	3.75	7.5	13.75	23.75	36.75

Determine the design load on the pile considering the settlement and shear criteria. Adopt a factor of safety of 2.0. **(8)**

(ii)A 12m long 300mm square pre-cast concrete pile is driven into a sand stratum by a single acting steam hammer. The weight of the hammer ram is 14kN and the stroke is 750mm. The pile showed a driving resistance of 5 blows/25mm penetration. Estimate the ultimate bearing capacity of the pile based on the Hileys formula. Take C = 0.00508m **(8)**

15a. For the retaining wall shown in fig.15(a) determine the active thrust on the wall by culman's construction.

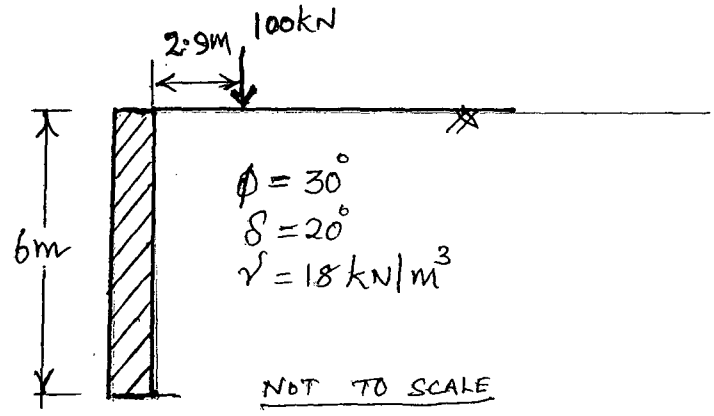


Fig. 15(a)

(16)

(OR)

15b. For the cantilever retaining wall shown in fig.15(b) determine the maximum and minimum pressure under the based of the cantilever. The relevant shear strength parameters of the backfill and foundation soil are C = 0, φ =35° and unit weight of soil γ = 17.5 kN/m^3 γ conc = 24kN/m^3 Find the factor of safety against sliding, considering the reduced value of base friction as 2/3φ°? Use Rankine theory to evaluate earth pressure.

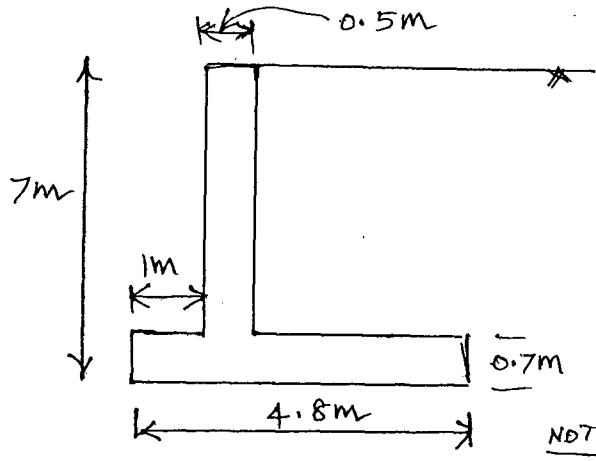


Fig. 15(b)

(16)