B.E (Full Time) DEGREE END SEMESTER EXAMINATIONS, November/December 2012

CIVIL ENGINEERING BRANCH

FIFTH SEMESTER – (REGULATION 2008)

15

CE9303 - FOUNDATION ENGINEERING

Time: 3 hrs **Max Mark: 100**

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. Calculate the area ratio of a Shelby tube sampler of outside diameter 125 mm and thickness of wall 1.25 mm.
2. List the stages of subsurface exploration.
3. Define allowable bearing capacity of soil.
4. Show the mechanism of general shear failure of footing with a neat sketch.
5. Enumerate the factors to be considered when deciding the depth of the footing when the footing is located adjacent to a sloping ground
6. List the situation in which raft footing is preferred.
7. Define negative skin friction.
8. List any two situations where a bored pile is preferred over a driven pile.
9. Show the variation of earth pressure with the of the wall movement using a neat sketch.
10. State the assumptions of Coulomb's earth pressure theory.

Part – B (5 x 16 = 80 Marks)

11. (i) The following data is obtained from seismic exploration. Determine the depth of the first soil layer. [8]

Distance from source (m)	10	20	30	40	50	60
Arrival time of first wave (10^{-3} sec)	30	60	90	110	130	140

(ii) Briefly explain standard penetration test with respect to procedure of the test and the major corrections adopted with the expression for the corrections. [8]

12. (a) Determine the ultimate bearing capacity as per IS method. For a (i) a square footing of size 3 m x 3 m (ii) strip footing of width 3 m (iii) rectangular footing of width 3 m x 4 m (iv) circular footing of diameter 3 m, laid at a depth of 1.5 m from the ground level. Backfilling is not done with proper compaction and groundwater table is at great depth. Take γ = 18 kN/m^3, c = 10 kN/m^2 and $\varphi = 30^0$. For $\varphi = 30^0$, N_c = 30.14, N_q = 18.4 and N_γ = 22.4. [16]

(or)

(b) A footing of size of 1.5 m x 1.5 m is founded at a depth of 1 m below ground level and it causes a pressure increment of 200 kN/m^2 at its base. [Fig.12 (b)]. Ground water is at

great depth. Determine the primary consolidation settlement at the middle of the clay layer. Assume 2:1 pressure distribution. Take C_c= 0.22 and e_0=1.30.

Also calculate the increase in settlement when the water table rises to the ground level. Take γ_{sat}= 22 kN/m^3 for sand and γ_{sat}= 19.5 kN/m^3 for clay. [16]

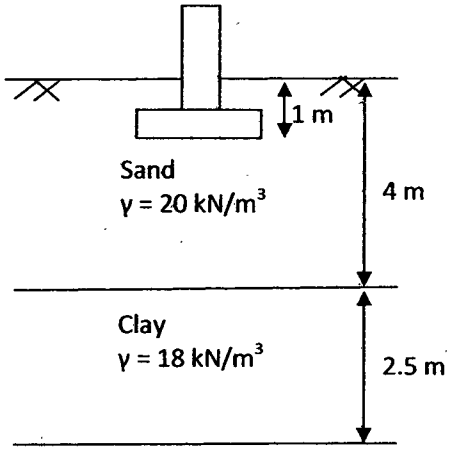

Fig. 12 b

13. (a) Design an isolated reinforced concrete footing for a column of size 300 mm x 300 mm carrying a load of 900kN. Calculate the width and thickness of the footing and also find the maximum bending moment. Allowable soil pressure is 250 kN/m^2. Take M20 grade of concrete and Fe415 steel. Assume any other relevant data. [16]

(or)

(b) (i) Explain the proportioning of a trapezoidal combined footing [6]

(ii) Explain in detail the steps involved in the conventional design of a mat foundation. [10]

14. (a) (i) A 25 cm diameter pile of length 10 m was subjected to a pile load test and the following data was obtained. Determine the allowable load. [10]

Load (kN)	0	500	1000	1500	2000	2500
Settlement during loading (cm)	0	0.55	1.45	2.3	3.3	4.5
Settlement during unloading (cm)	3	3.4	3.8	4	4.3	4.5

(ii) Explain Engineering News Record Formula and Hiley Formula used for calculating the capacity of the pile. [6]

(or)

(b) (i) List and describe the various classifications of piles. [8]

(ii) A group of 9 piles, 8m long, is used as the foundation for a column. The piles are 30 cm diameter with a centre to centre spacing of 90 cm, the subsoil consists of clay with unconfined compression strength of 180 kN/m^2. Estimate the safe load (Take factor of safety = 3.0) [8]

15. (a) A 6m high gravity retaining wall retains cohesionless soil of $\gamma = 16$ kN/m^3 and $\varphi = 34^0$ (Fig. 15a). (Use Coulomb's theory). Check the stability of the wall against possible modes of failure. Take angle of friction between the wall and backfill, $\delta = 2/3\varphi$. [16]

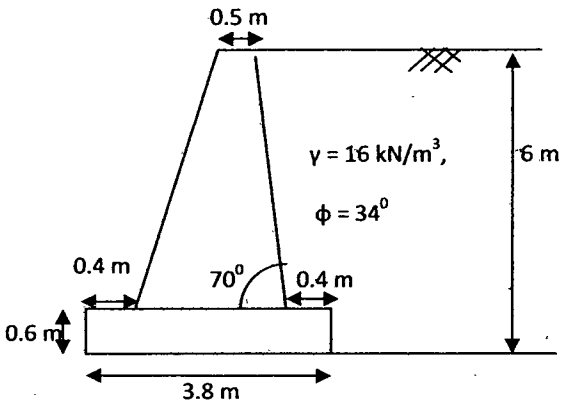

Fig. 15a

(or)

(b) (i) Derive an expression for active earth pressure for a c-φ soil based on Rankine's theory. Draw the active pressure distribution diagram. [8+3]

(ii) For a soil with the following properties, c = 21 kN/m^2, $\varphi = 15^0$ and $\gamma = 17$ kN/m^3. Calculate the depth of tensile crack and maximum depth of unsupported excavation. [5]