Code No: R100501

ADVANCED FOUNDATION ENGINEERING

Time: 3 hours **Max.Marks:100**

Answer any FIVE questions
All questions carry equal marks

\- - -

1. List the various field tests that are to be carried out in the sub-surface exploration programme and write their applicability in the soil investigation. Describe in detail the Standard Penetration Test and write its usefulness in foundation design. [20]

2.a) Discuss the following with their practical relevance:
i) Rock core recovery and
ii) Rock Quality Designation.

b) Discuss how bearing capacity of footings is estimated when footing is resting on thin layer of soft clay and below which there is a stiff clay layer. [8+12]

3.a) Discuss the merits of IS code method of bearing capacity of soil compared to the Meyerhoff's, Hansen's and Vesic theories of bearing capacity.

b) Calculate the ultimate bearing capacity, according to the Brinch Hansen's method, of a rectangular footing 2.5m × 2.5m, at a depth of 1.5m in a soil for which unit weight 17.5 kN/m^3, *cohesion* 50 kPa, and angle of internal friction is 20^0. The ground water table is far below from the footing base. The total vertical load is 1250 kN and the total horizontal load is 50 kN at the base of the footing. Hansen's factors for $\phi = 20^0$ are $N_c = 14.83$, $N_q = 6.40$, and $N_\gamma = 3.54$. Determine also the factor safety. Use the following factors also.

$$s_c = 1 + 0.2\, b/L \qquad d_c = 1 + 0.35\, D_f/b$$

$$s_q = 1 + 0.2\, b/L \qquad d_q = 1 + 0.35\, D_f/b$$

$$s_\gamma = 1 - 0.4\, b/L \qquad d_\gamma = 1.0$$

$$i_c = i_q = \left(1 - \frac{H}{V + A\, c \cot \phi}\right)^2 \qquad i_\gamma = (i_q)^2$$

[5+15]

4.a) Discuss the following with clear illustrations
i) Elastic settlement
ii) Consolidation and settlement
iii) Creep settlement.

b) Discuss the Teng's and Mayerhof's formulations for bearing pressure estimation in soil. [10+10]

5.a) Discuss in detail with clear illustrations the method of estimation of elastic settlement of cohesionless soil by the Schmertamaunn's method.

b) Discuss the Burland and Burbidge settlement formulas for NC and OC soils. [14+6]

6.a) What is the basis on which the dynamic formulae are derived? Mention two well known dynamic formulae and explain the symbols involved?

b) A reinforced concrete pile of diameter 0.40m, and 12 m long is driven into coarse sand with unit weight of 18 kN/m ^{3} and angle of internal friction of 31 ^{0}. What is the allowable load on the pile? For $\phi=31^0$, $N_q=14$. Make necessary assumptions. Assume Factor of Safety as 3. [8+12]

7.a) Discuss with neat sketches the instances where piles experience lateral loads?

b) Discuss the Reese and Matlock non-dimensional solutions for vertical piles subjected to lateral loads. [6+14]

8.a) What is subgrade modulus? Discuss with neat sketches of test setup how subgrade modulus is determined from the plate load test.

b) Discuss the Winkler's model and its application in foundation engineering. [12+8]

--ooOoo--