

Use Separate Answer script for each half

FIRST HALF

Answer any three questions

(Two Marks are reserved for neatness)

- 1.(a) Distinguish between shallow foundations and deep foundations.
(b) Calculate the net safe bearing capacity of a square footing (2m x 2m) founded at a depth of 1m in a silty clay deposit ($\phi_u = 0$) having unconfined compressive strength of 60 kPa.. Use IS 6403 recommended method and a factor of safety of 2.5.
(c) If the load on the footing has both horizontal and vertical components, how will the net safe bearing capacity change? (5+6+2)
- 2.(a) How would you estimate the (net) safe load on a footing subjected to a vertical load and a uniaxial moment?
(b) How would you obtain the pressure distribution underneath such a foundation?
(c) Determine the net safe bearing capacity of a square footing (2.0m x 2.0m) founded at a depth of 1m in a deposit of medium sand having $\gamma = 18 \text{ kN/m}^3$, $\gamma_{\text{sat}} = 19.5 \text{ kN/m}^3$ and $\phi' = 28^\circ$. The water table is located at a depth of 1.0m below G.L. Given, for $\phi' = 28^\circ$, $N'_c = 16.8$, $N'_q = 7.5$ and $N'_\gamma = 5.0$. Use I.S. 6403 recommended method. (4+3+4)
- 3(a). Define N-Value and $(N_1)_{60}$ value of a soil.
(i) How would you apply corrections to the observed N-values?
(ii) If you are to obtain an average of the corrected N-values, N-values from which depth range are to be taken if it is to be used for bearing capacity and settlement estimates?
(iii) After obtaining the average N-value, in how many ways can you obtain the bearing capacity?
(b) In a certain situation there are two columns of (500 x 500) square cross-section carrying loads of 1100 kN and 700 kN. The heavier column is the exterior column for which the projection beyond the centre line of column is not permissible due to the position of the property line. Proportion a combined footing if it is desired to have uniform pressure distribution under this footing. For the initial design the allowable bearing pressure can be taken as 150 kPa. (3x2+5)
- 4(a) Describe the method of estimation of settlement of footings on cohesionless soils based on SPT values. Why is the use of elastic formula not recommended here?
(b) How would you estimate the consolidation settlement of footings on a (i) N.C. clay and an (ii) O.C. clay? In which situation the λ -correction is to be applied?
(c) What other corrections are to be applied to the calculated values of settlements? (3+5+3)
- 5(a) Write short notes on any three of the following: (3x11/3)
i) Safe bearing pressure of a footing from plate load test results
ii) Contact pressure below foundations
iii) Modes of failure of shallow foundations
iv) Usefulness and Limitations of plate load tests
v) Usefulness of net safe bearing capacity
vi) Correlation between maximum total and maximum differential settlements
vii) Advantages of Mat foundations
viii) Floating foundations

SECOND HALF

Answer any three questions

(Two Marks are reserved for neatness)

6(a) Classify deep foundations.

- (b) Enumerate the various methods of classification of piles. Which method is currently accepted as the best? Give examples of piles classified thus.
- (c) State the chief advantages and disadvantages of (i) precast driven piles and (ii) bored cast-in-situ piles
- (d) What are the various methods of determination of pile bearing capacity (2+3x3)

7(a) Define the different components of a well foundation with a neat sketch.

- (b) What are the design requirements for (i) the plan dimensions and (ii) the depth of a well as per IS: 3955 and IRC specifications? (5+2x3)

8(a) In pile load test, enumerate the purposes of the 'initial test' and the 'routine test'?

- (b) Describe the maintained load method of load test for a vertical compressive load.
- (c) The following data were obtained in an initial vertical (compressive) load test on a 300 mm diameter 10m long pile. Plot the load-settlement curve and determine the safe load as per IS: 2911.

Load (kN)	150.0	200.0	250.0	300.0	400.0	500.0	600.0
Settlement (mm)	1.50	2.20	2.75	3.6	5.75	10.75	30.0

- (d) If the same load-settlement curve as above has been obtained for a routine test on a working pile at the same site, designed to carry a working load of 180 kN, check whether the pile has passed the test. (3x3+2)

9(a) Describe the Terzaghi-Peck method of determination of group capacity considering block failure. How would you then obtain the safe load on the group?

- (b) Describe how you would calculate the group settlements for piles in clay?

(5+6)

10. Write short notes on any three of the following:

(3x11/3)

- (i) Static formula for a single pile in granular soils
- (ii) Negative skin friction in piles
- (iii) Pile capacity from the SPT test data
- (iv) Dynamic pile formulae and their limitations
- (v) Critical depth for piles in cohesionless soils
- (vi) Various uses of piles
- (vii) Adhesion factor to be used in the static formula
- (viii) Group settlement of piles in cohesionless soils