MODEL QUESTION PAPER

13.805.3 ELECTIVE III- DEEP FOUNDATIONS

PART- A (Answer all questions)

1. Discuss different methods for the installation of piles ?
2. What is the basis on which the dynamic formulae are derived ? Mention two well known dynamic formulae and explain the symbols involved.
3. Explain the procedure for finding the uplift capacity of piles in clays.
4. What are the advantages and disadvantages of drilled piers.
5. Explain the steps involved in sinking of wells. **(5x4 =20 marks)**

PART- B

Answer one full question from each Module

Module-I

6. a) A friction pile 300 mm in diameter is proposed to be driven in a layer of uniform clay. The pile tip is assumed to carry 20% of the load. The skin friction between the pile surface and the soil may be as taken 50 kN/m^2. Determine the length of the pile required to carry a safe load of 200 kN with a factor of safety of 4. Also determine the cohesion of the clay. **12 marks**

   b) A 300 mm square concrete pile which is 10 m long, is driven into coarse sand (γ = 18.5 kN/m^3, N =20). Determine the allowable load with a factor of safety of 3. **8 marks**

OR

7. Explain with neat sketches the conventional pile load test and cyclic load test**.** **20 marks**

Module-II

8. a) A group of 9 piles with 3 piles in a row was driven into a soft clay extending from ground level to a great depth. The diameter and length of the piles were 30 cm and 10 m respectively. The unconfined compression strength is 70 kPa. If the piles were placed 90 cm c/c , compute the allowable load on the pile group on the basis of a shear failure criterion for a factor of safety of 2.5. **12 marks**

b)Explain Skempton's and Meyerhof's methods for determination of settlement of pile groups in sands. **8 marks**

OR

9. A group of piles has to support a vertical axial load of 2000 kN. The piles are driven into clay and have a length of 10.5 m. The thickness of the clay stratum is 15 m. The clay is followed by a rock. The saturated unit weight of clay is 19 kN/m^3 and its cohesion is 25 kN/m^2. The clay is normally consolidated and has a liquid limit of 60. Its specific gravity is 2.7. The water table is at the ground surface itself. Assuming the diameter of the piles as 300 mm, design a friction pile group. A factor of safety of 3 is required against shear failure. Compute its ultimate settlement. **20 marks**

Module III

10. Estimate the load carrying capacity of drilled pier whose shaft is 100 cm diameter for a length of 8m. The diameter is belled to 250 cm in a length of 4 m at the bottom. The top 10 m of the pier passes through submerged soft clay (γ_{sat} = 18 kN/m^3) with cohesion 20 kPa.The pier rests on dense sandy gravel with an angle of friction of 38^o. The values of N_c, N_q and N_γ for 38^o are 75, 80 and 50 respectively, $\propto$ =0.8. What are the assumptions used in the computation. **20 marks**

OR

11 a). A straight –shaft drilled pier of 1.2 m diameter is constructed in a dense sand deposit($\varphi=40^o$ and γ= 21kN/m^3). The total depth of the pier is 15 m. Estimate the allowable load with a factor of safety of 3. Nq = 140. **10 marks**

b) Explain the construction stages of drilled piers. **10 marks**

Module IV

12. A cylindrical well of external diameter 6 m and internal diameter 4 m is sunk to a depth 16 m below the maximum scour level in a sand deposit. The well is subjected to a horizontal force of 1000 kN acting at a height of 8 m above the scour level. Determine the total allowable equivalent resisting force due to earth pressure, assuming that (a) the well rotates about a point above the base, and (b) the well rotates about the base. Assume γ'=10 kN/m^3, $\varphi=30^o$, and factor of safety against passive resistance =2. Use Terzaghi's approach.

20 marks

OR

13.a) A concrete well foundation is circular in shape and its outer diameter is 5 m. It is to be sunk in loose sand by its self-weight. The unit skin friction of sand is 25 kN/m^2 and the unit weight of concrete is 24 kN/m^3. Determine the thickness of the steining. **10 marks**

b) What are the problems encountered in well sinking? How are they minimized?

10 marks