Bachelor of Engineering (Civil Engineering)
[5th Year; 2nd Semester Supplementary Examination - 2024]
Advanced Foundation Engineering

Total Time: Three Hours

Full Marks 100
(Part I: 50 + Part II: 50)

*Use a separate Answer-Script for each part*

Part I (50 Marks)

(Codes are NOT Allowed)

Answer all in brief and to-the-point (Assume any relevant data if not provided, but required)

1 Explain the behavior of expansive soil with respect to the mineralogical composition of soil. What is (10) "Drilling Mud"? How does it work?

2 Explain the parameters given in the ultimate load-bearing capacity of an under-reamed pile in clay with a neat sketch. (20)

A singly-reamed, 8 m long, RCC pile (as shown in the figure) weighing 20 kN with 350 mm shaft diameter and 750 mm under-ream diameter is installed within stiff, saturated silty clay (undrained shear strength is 50 kPa, adhesion factor is 0.3, and the applicable bearing capacity factor is 9) to counteract the impact of soil swelling on a structure constructed above. What would be the estimated vertical and uplift capacity (rounded off to the nearest integer value in kN) of the pile?

8000 mm

400 mm

350 mm

750 mm
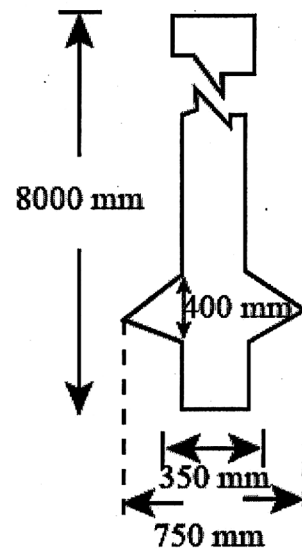
3 (a) Draw a typical well foundation indicating its components. (5)

(b) Mention the precautions that are useful in avoiding tilts and shifts in wells. How the tilt and shift (5) can be rectified, if any happened.

(c) Mention the types of caission foundations along with their advantages and disadvantages with neat (10) sketches.

[Turn Over

Advanced Foundation Engineering
CE/ 5/ T/505 B
Elective – II, G-III
Part – II (50 Marks)

Answer all the questions:

Assume reasonable values of data, if not given.

Q. 1 a) What do you mean by "Dewatering"?

b) Discuss different types of common dewatering methods used in application with neat sketches – indicate also the specification and purpose of applicability. (2+18)

Q. 2 a) Draw the earth pressure distribution diagram for different types of cohesive and cohesion less soil.

b) A 12m deep and 20m wide cut is to be made in soft clay of un-drained strength of 2.5 t/m^2 and unit weight of1.90 t/m^3. If the first strut is placed at a depth of 2.0m below ground level, consecutive struts at 4.0 m interval and additional strut at the bottom surface. Find out strut loads for a horizontal spacing of 2.75 m. (5+10)

Q. 3 a) Derive the fundamental expression for amplitude in force vibration system.

b) Check the adequacy of the machine foundation against the problem of resonance in vertical - horizontal direction and amplitude in vertical direction only for table given below. Calculate also the maximum amplitude. Assume, unit weight of concrete is 2.5 ton/m^3 and neglect coupling effect in rocking case. (5+10)

Data Table:

Machine Data and its foundation from Manufacturer:				
Element System Marked	Dimensions of Element if Any			Weight (W$_i$)
(i)	L$_{Xi}$ in meter	L$_{Yi}$ in meter	L$_{Zi}$ in meter	W$_i$ in ton
Compressor	-	-	-	17.9
Motor	-	-	-	8.2
Top Block	4.3	4.8	1.5	?
Bottom Block	8.3	4.8	15	?

Speed of compressor 300 r.p.m, unbalanced vertical force 4.2 ton, rotary type machine of permissible amplitude 200 micron.

Soil Data from Geo-technical Investigator:

Sandy soil, C$_u$ is 3.0×10^3 ton/m^3, C$_t$ is 1.2×10^3 ton/m^3