M.Tech.(GTE) – I

Advanced Foundation Engineering

Duration: 3 hours | Max. Marks: 70

Note: Answer Question No.1, which is compulsory and any FIVE questions from the rest

1 Answer all the questions (10x2)

a) Differentiate between the Terzaghi's and Mayerhoff's Bearing Capacity theories.

b) State the reasons for preferring raft foundations

c) What is elastic settlement. How do you estimate it.

d) State the limitations of dynamic formula in pile foundations.

e) What is negative skin friction in Piles. State the causes of negative skin friction.

f) Describe advantages of under reamed pile foundation.

g) What are the various forces acting on well foundation

h) Describe the significance of scour depth

i) State the foundation techniques available for structures to be constructed in expansive soils?

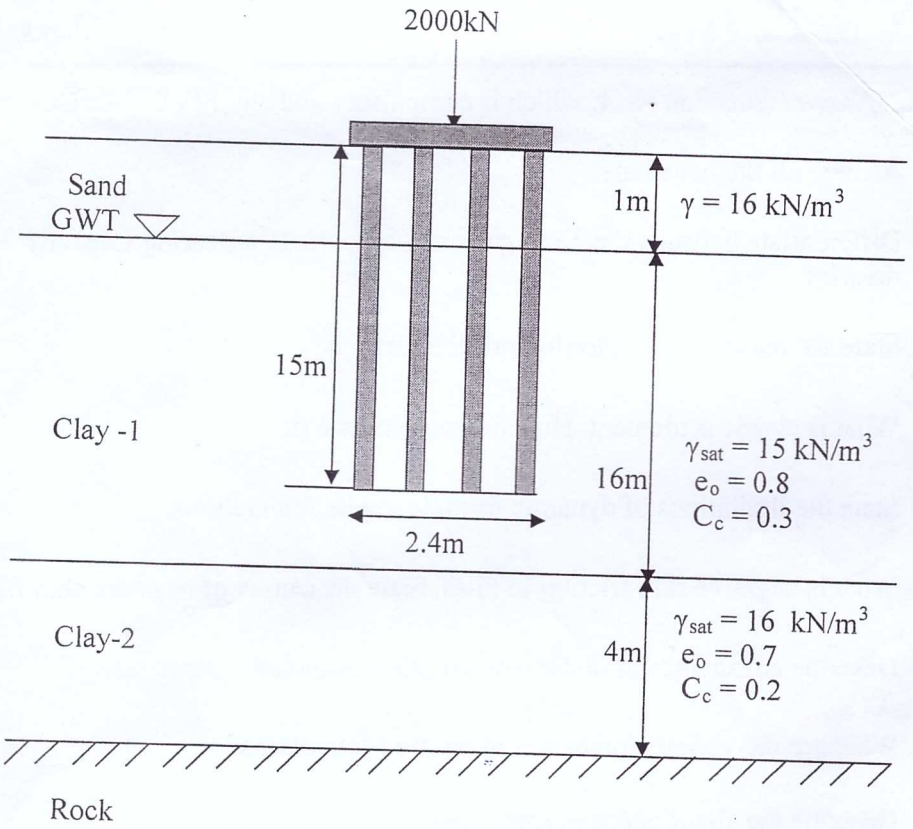
j) Classify machine foundations according to I.S.Code with neat sketches

2) A square footing of 1.5x1.5m is placed at a depth of 1.1m below ground level in a sandy soil having unit weight of 18kN/m^3 and angle of shearing resistance of 30^0. If the load is eccentrically applied with 0.3m and 0.15m in both the directions. Determine the ultimate load. (10)
(Take $L_1/L=0.85$ and $L_2/L=0.21$ for $e_L/L=0.2$ and $e_B/B=0.1$ &
for $\phi=30^0$ $N_c=30$, $N_q=18$ and $N_\gamma=22$)

3a) State the different possible cases that may arise for two way eccentricity of a rectangular footing. (2)

b) A continues foundation is laid in a granular soil. The properties of soil are as follows: B = 1.5 m, D_f = 1.6m, γ = 18KN/m^3 and $\phi = 40^0$. The load is inclined at 20^0. Calculate the gross ultimate bearing capacity using Mayerhoff's and Hansen's theories. (8)
(Take N_{cq}= 7 & $N_{\gamma q}$= 100 for $\alpha = 20^0$ and $D_f/B=1$; For $\phi = 40^0$, take N_q= 64 & N_γ= 94).

4) Determine the settlement of square pile group shown in the figure below. (10)
Diameter of Pile =30cm.



5a) Discuss the limitations of pneumatic sinking of wells. (3)

b) A cylindrical well of external diameter 6m and internal diameter 4m is sunk to a depth 16m 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 8m above the scour level. Determine the total allowable equivalent resisting force due to earth pressure, assuming that (7)
(i) The well rotates about a point above the base, and
(ii) The well rotates about the base.
Assume $\gamma^1 = 10$ kN/m^3, $\phi = 35^0$ and factor of safety against passive resistance = 2. Use Terzaghi's approach.

6a) What are the causes of Tilts and Shifts in well foundations. Describe the methods adopted for rectifying them. (3)

b) Compute the embedment length D of the sheet pile wall to retain 6m of granular soil (up to deeper depth) having unit weight of 20kN/m^3 and angle of shearing resistance of 30^0. Water table is at a depth of 3m from top of sheet pile. (7)

7a) What are the six degrees of freedom for a rigid block (3)

b) The following results were obtained from a plate load test conducted in a (7)
homogeneous sandy soil with

with1.5m x 1.5m can carry safely when the footing is placed at same depth.

Applied Pressure (kPa)	25	50	100	200	300	400	500
Settlement (mm)	0.5	0.9	1.8	3.5	5.6	8.4	13.2

8a) What is the significance of permissible settlement? State the permissible settlements for Isolated and raft foundations in clays and Sandy Soils (3)

b) Determine the allowable bearing capacity of a 1.5mX 1.5m square footing placed at a depth of 2.0m in a sandy deposit having a unit weight of 19kN/m^3 with SPT value of 37. Water table is at depth of 1.5m. Determine the allowable bearing capacity for 50mm permissible settlement after applying suitable corrections for SPT value. (7)