Subject code TCE-603

PAPER ID-

Roll No. to be filled in your Answer Book

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B.Tech.
Civil Engineering, IV
Foundation Engineering
(TCE-603)

Time- 3 Hours   Max marks: 100

NOTE:

i. All questions are compulsory.
ii. Draw diagrams wherever necessary.
iii. All questions carry equal marks. .

1. Attempt any **FOUR** parts of the following.   5 X 4

   (A) What is negative Skin Friction? List out the possible conditions which may cause negative skin friction.
   (B) With the help of neat sketches, explain different types of shallow foundation.
   (C) A timber pile is being driven with a drop hammer weighing 20 kN having a free fall of 1 meter. The total penetration of the pile in the last 5 blows in 30 mm. Determine the load carrying capacity of pile using Engineering News formula.
   (D) Explain Terzaghi theory. List out the assumptions of Terzaghi theory.
   (E) Define the following:
      1. Plate Load Test
      2. Standard Penetration Test

2. Attempt any **FOUR** parts of the following   5 X 4

   (A) Find the settlement of a footing of width 1.2m with the following plate load test results for
      Sandy soil
      Clayey soil
      Settlement of the plate 15 mm, Width of the square plate 400mm.

   (B) A 2m wide strip footing is located at a depth of 2m in a stiff clay of saturated unit weight of 20kN/m3 and having $\Phi u=0$ and $Cu=120kN/m2$. Using Terzaghi's bearing capacity equation, compute the safe load carried by footing per meter length with factor of safety y=3 with respect to shear failure. Given Nc=5.7.

(C) What are the various method of construction of well foundation? Explain tilt and shift.

(D) Nine Piles of 300mm dia. and 8m length are arranged in a square pattern for the foundation for a column in a uniform deposit of medium stiff clay (qu=100kN/m2). If the Centre to Centre spacing of piles is 900mm and adhesion factor is 0.9, calculate the capacity of the pile group assuming FOS=2.5.

(E) Define Infinite and Finite slope. What are the different types of finite slope failures?

3. Attempt any **TWO** parts of the following   10X2

(A) A counterfort wall of 10m height retains non cohesive backfill. The void ratio and angle of internal friction of the backfill respectively are 0.70 and 30^0 in the loose state and they are 0.40 and 40^0 in the dense state. Calculate and compare active and passive earth pressure in both the states. Take specific gravity of soil grains as 2.70. Give your comments on the results.

(B) A group of friction pile of 30cm diameter, subjected to net load of 2000kN, as shown in figure. Calculate the total settlement in the layer II due to pile group. Assume slope=1H: 2V.
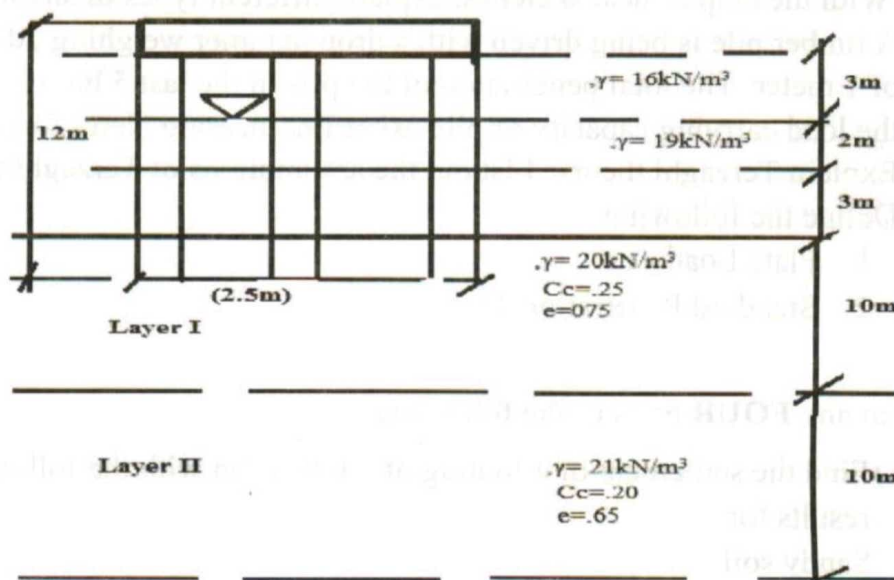
(c) Define factors affecting bearing capacity. Explain different types of shear failure of soils.

4. Attempt any **TWO** parts of the following   10X2

a) The following data was obtained from plate load test carried out on a 60cm square test plate at a depth of 2m below ground surface on a sandy soil which extends up to a large depth. Determine the settlement of a foundation 3.0m*3.0m carrying a load of

110t and located at a depth of 2m below the ground surface. Use graph to solve the above problem.

Load intensity(t/m^2)	0	5	10	15	20	25	30	35	40
Settlement(mm)	0	2.0	4	7.5	11	16.3	23.5	34	45

(b) Define the following:
1. Gross bearing capacity
2. Ultimate bearing Capacity
3. Net Ultimate bearing capacity
4. Net safe bearing capacity
5. Safe bearing capacity

(c) Design the square pile group to carry 400kN in clay with an unconfined compression strength of 60kN/m^2. The piles are 300mm diameter and 6m long. Adhesion factor may be taken as 0.6.

5. Attempt any **TWO** parts of the following   10 X 2

(A) An Embankment of 10 m height inclined at an angle of 36 degree to the horizontal. Stability analysis is done for the following forces per meter run.

Σ Shearing forces = 450 kN
Σ Normal forces = 900 kN
Σ Up thrust forces (Neutral forces) = 216 kN

The length of failure arc is 27 meter. C=20kN/m^2 and angle of internal friction is 18 degree.
Find out the factor of safety of the slope with respect to shear failure.

(B) A 3.0m square footing is located in a dense soil and a depth of 2.0m. Determine the ultimate bearing capacity for the following water table positions:
   (i)   At ground surface
   (ii)   At footing level and
   (iii)   At 1m below the footing

The moist unit weight of sand above the water table is 18kN/m^3 and the saturated unit weight is 20kN/m^3, Φ=35^0, c=0, N_q=33 and $N_\square$=34.

(C) Explain different types of machine foundation. Also differentiate between cyclic plate load and Block Resonance test in brief.

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