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M. TECH.
(SEM II) THEORY EXAMINATION 2017-18
ADVANCE FOUNDATION ENGINEERING

Time: 3 Hours ***Total Marks: 70***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. What is floating foundation?
b. What is differential free swell of soil?
c. State the reason for preferring raft foundations.
d. State the limitations of dynamic formula in pile foundations.
e. Write the significance of scour depth.
f. Classify machine foundations according to I.S. code.
g. What is meant by hysteretic damping?

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SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a. A foundation in sand will be 5 m wide and 1.5 m deep. Adopting a factor of safety of 2.5, what will be safe bearing capacity if the unit weight of the sand is 1.9 gm/ c.c. and angle of internal friction is 35°. How does it compare with safe bearing capacity for surface loading? $N_C = 57$, $N_q = 44$, $N_y = 42$
b. What is negative skin friction? What is its effect on the pile? A 30 cm. diameter concrete pile is driven in a normally consolidated clay deposit 15 m thick. Estimate the safe load. Take Cu = 70kN/ m^2 $\propto$ = 0.9 and F.S. = 2.5.
c. Discuss the components of well foundation and draw the neat sketch of a well foundation. Explain all the terms in brief.
d. Explain analysis of block foundation based on elastic half space theory.
e. Write about the cantilever sheet piling in granular soils.

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

(a) Explain in detail, the effects of size of footing on both the ultimate bearing capacity & the settlement.
(b) Determine the ultimate bearing capacity of the footing, 1.5 m wide and its base at a depth of 1 m, if the ground water table is located :
  i. At a depth of 0.5 m below the ground surface.
  ii. At a depth of 0.5 m below the base of the footing.

$Y_{sat} = 20$ KN/ m^3, $Y_d = 17$ KN/ m^3, $\varphi' = 38^0$ & c = 0. Use Terzaghi's theory. $N_q = 60$ & $N_y = 75$.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) A nine pile group arranged in a square pattern is used as a foundation for a column in sand ($\varphi' = 32^0$). Piles 300 mm in diameter and 10 m in length are placed at a spacing of 900 mm in each direction. Calculate the ultimate load capacity of the pile group. Assume the unit weight of soil as 18 KN/m^3. Use Berezantzev recommendation for bearing capacity for Nq.

(b) Specify the various methods to determine the load carrying capacity of piles and describe about pile load tests with neat diagrams.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) What are laterally loaded and battered piles and why batter piles are more effective than vertical piles in resisting the horizontal loads? Also determine the forces in the piles by column's method.

(b) A raft foundation has to be supported by a group of concrete piles. The gross load to be carried by the pile group is 250 t, inclusive of the weight of the pile cap. The subsoil consists of a 25 m thick stratum of normally consolidated clay having UCS of 4.8 t/m^2 and an effective unit weight of 0.9 t/m^3. Design the pile group with a factor of safety 3 against the shear failure.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Which type of pile foundations you will use for the expansive soils? Explain the particular types with a neat sketch. Also give the expression for finding the capacity of piles for single bulb under reamed piles.

(b) Write a note on efficiency of pile group with necessary sketches.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) What is the design criteria for foundations of reciprocating machines based on IS: 2874 (I) - 1982? Discuss criteria for the design of foundation in case of free vibration without damping.

(b) A foundation block of weight 30 KN rests on a soil for which the stiffness may be assumed as 25000 KN/m. The machine is vibrated vertically by an existing force of 3.0 sin (30t) KN. Find the natural frequency, natural circular frequency and the amplitude of vertical displacement. The damping factor is 0.50.

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