# B. Tech.

## (SEM. VI) THEORY EXAMINATION 2011-12

## ADVANCED FOUNDATION DESIGN

*Time : 2 Hours*                              *Total Marks : 50*

**Note :** Attempt *all* questions. If required any missing data; then choose suitably.

1. Attempt any *two* parts of the following :          **(6.5×2=13)**

   (a) Discuss about the Westergaard's solution for the determination of the vertical stress due to appoint load P in an elastic solid medium. Compare the utility between Westergaard's solution and Boussinesq's solution.

   A concentrated load of 40 kN is applied vertically on a horizontal ground surface. Determine the vertical stress intensities at the following points :

   (i) At a depth of 1 m and at a radial distance of 3 m from the line of action of the load.

   (ii) At a depth of 3 m and at a radial distance of 1 m from the line of action of the load.

(b) The 5 m × 10 m area shown in Fig. 1a is uniformly loaded with 100 kPa. Find the vertical stress at a depth of 5 m under Y.
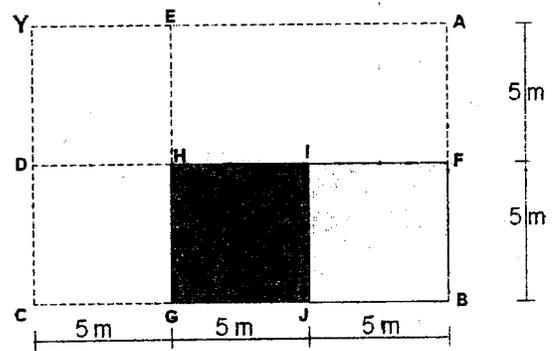


**Fig. 1a**

(c) Draw a Newmark's influence chart on the basis of Boussinesq's equation, for an influence factor of 0.005.

Using this Newmarks's chart; determine the vertical stress intensity at a depth of 2.0 m below the point A of the raft footing shown in Fig. 1b. The uniformly distributed load on the raft is 8.5 t/m².
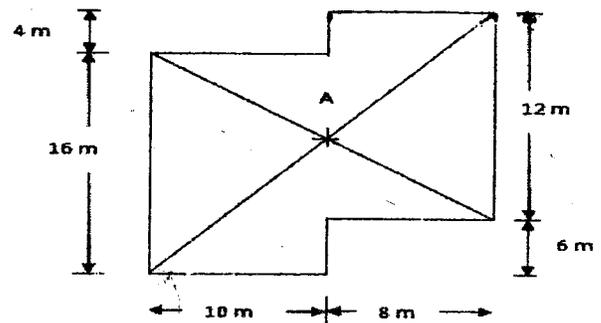


**Fig. 1b**

ECE011/PUR-40270 (1-Drg.)　　2

2. Attempt any *two* parts of the following : (6.5×2=13)

(a) Write the Meyerhof's bearing capacity equation along with the detailed equations of their correction factors. Also calculate the settlements of shallow foundation due to primary and secondary consolidation.

(b) A square foundation is 1.5 m × 1.5 m in plan. The soil supporting the foundation has a friction angle $\varphi' = 20°$ and $c' = 15.2$ kN/m². The unit weight of soil, $\gamma = 17.8$ kN/m³. Determine the allowable gross load on the foundation with a factor of safety of 4 for the general and local shear failure of the soil. Assume that depth of foundation is 1.0 m. For $\varphi' = 20°$, $N_c = 17.69$, $N_q = 7.44$, $N_\gamma = 3.64$, $N'_c = 11.85$, $N'_q = 3.88$ and $N'_\gamma = 1.12$.

(c) Fig. 2(a) shows a shallow foundation on a deposit of sandy soil that is 3 m × 3 m in plan. The actual variation of the values of the modulus of elasticity with depth determined by using the SPT values are also shown in Fig. 2a. Using

the strain influence factor method, estimate the elastic settlement of the foundation after five years of construction.
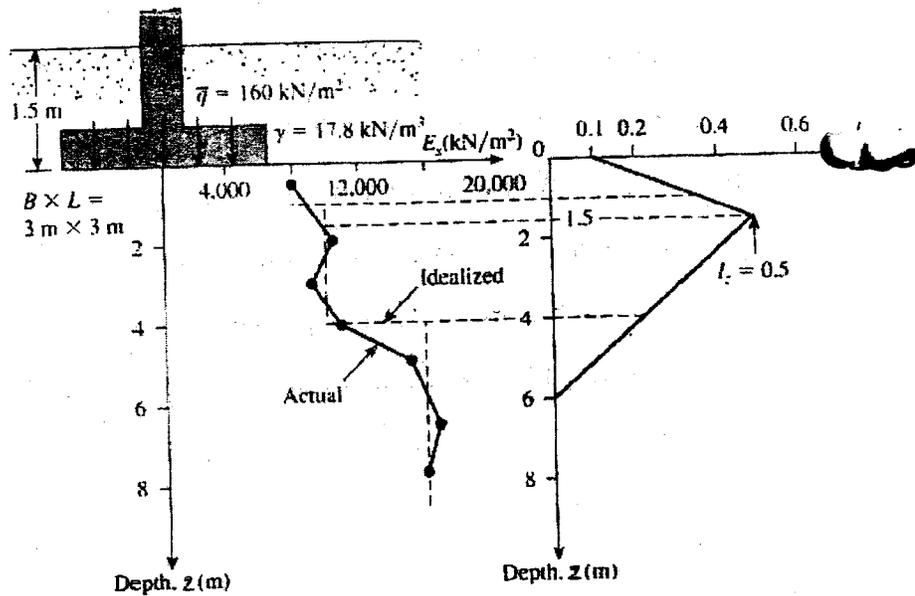


**Fig. 2a**

3. Attempt any *two* parts of the following : **(6×2=12)**

   (a) A group of 20 piles, each having a diameter of 400 mm and 10 m long, are arranged in 4 rows at a spacing 1.0 m centre to centre. The capacity of each pile is 380 kN. Determine the group capacity of the piles.

   (b) What do you mean by laterally loaded piles ? Why batter piles are more effective than vertical piles in resisting the horizontal loads ? Give all the basic steps to find the forces in piles by the Column's Method.

(c) Explain all the components with their relevant use with a neat sketch. Write about the various methods for rectification of Tilts and Shifts in the well foundation.

4. Attempt any *two* parts of the following : (6×2=12)

(a) What are the various methods for analyzing the stability analysis of finite slopes ? Write all the steps with their neat sketch; involved in the Bishop's simplified method of slices for analyzing the stability of slopes.

(b) Discuss the Taylor's stability number. Show and briefly explain the curve between stability number and slope angle.

A slope of infinite extent is made in a dense sand layer at an angle of 30° to the horizontal. Determine the factor of safety of the slope against the shear failure if the angle of internal friction of the soil be 36°.

(c) What do you mean by coefficient of elastic uniform compression ? Write the Barken's equation for the this coefficient.

A machine weighing 550 kN is mounted on a concrete foundation block on soil layer, having area 26 m² and its weight is 1025 kN. The system is subjected to a central vertical linear forced vibration. The coefficient of elastic uniform compression for the soil is 120000 kN/m³. Calculate the natural frequency of the system.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2446    Roll No. ☐☐☐☐☐☐☐☐☐☐

# B. Tech.

## (SEM. VI) THEORY EXAMINATION 2011-12

## ADVANCED FOUNDATION DESIGN

Load $q_o$ per unit of area

$m = \dfrac{x}{z} ; n = \dfrac{y}{z}$

m and n are interchangeable

$\sigma_z = q_o I$

Influence value, I

Value of n