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Jaypee University of Information Technology, Waknaghat
End Sem Exam May 2015

Course code: 10B11CE612 Max Time: 3 hours
Course name: Foundation Engineering
Credits: 4 Max marks: 45

Note: Answer all questions in each section in continuation.

Section A (Each question is of 1 mark.)

1. In a sand stratum, water table is at a depth of 5 m. If the unit weight of sand is 17 kN/m^3, determine the effective vertical stress at a depth of 10 m. If the angle of internal friction for sand is 30^o, what might be the horizontal stress at 10 m?

2. A 1m x 1m square footing transmits a load of 1000 kN to a depth of 1.5 m. The water table is near the ground surface. Compute the **net load intensity** (**nli**). Is the footing a shallow foundation?

3. Sketch the load settlement curves for dense and loose sands. What is the meaning of "ultimate bearing capacity?" Is the term well defined for loose sands?

4. What are three components of total vertical settlement in shallow footings? Which component do you need for (a) granular soils, and (b) saturated clays?

5. Design a square footing to support a column load of 64 tonne if nabp = 16 t/m^2. (D_f=1.5 m)

6. A 400 mm square pile, 15 m long, is driven in a clay deposit with an unconfined compression strength of 75 kN/m^2. Find the ultimate load capacity, Q_u. ($\alpha = 0.8$)

7. Sketch a seamless thin-walled sampler called Shelby tube. If OD = 51mm and ID = 48mm, compute the area ratio. Can the tube take undisturbed samples?

8. Present an approximate method for determining the depth of embedment for a cantilever sheet pile wall in granular soils.

9. Construct a neat sketch showing the various components of a block vibration test,

P.T.O.

Section B (Each question is of 4.5 marks.)

1. Calculate the ultimate bearing capacity of a square footing resting on a dry sand stratum, 3m x 3m in plan, placed at a depth of 2m below the ground surface. $\gamma = 17$ kN/m^3 and $\varphi' = 36°$. What will be the percent change in the ultimate bearing capacity if the ground water table rises to the base of the footing? (N_c=63.5, N_q=47.2, N_γ=56.7)

2. With neat illustrations, explain 5 major functions of geosynthetics.

3. Construct a very neat labeled sketch showing the various components of a well foundation.

Section C (Each question is of 7.5 marks.)

1. What are the assumptions behind Terzaghi's theory of bearing capacity? Sketch the rupture surface assumed in the theory. What is the approximate depth of the rupture zone?
Calculate the ultimate bearing capacity of a square footing in saturated sand, 3m x 3m in plan, placed at a depth of 2m below the ground surface. The load on the footing acts vertically at an eccentricity of 0.5m along the width with respect to the center of the footing. The water table is close to the ground surface. Also, $\gamma_{sat} = 19$ kN/m^3 and $\varphi' = 36°$. (N_c=63.5, N_q=47.2, N_γ=56.7).

2. A group of 9 piles, 10 m long is used as a foundation for a bridge pier. The piles used are 30 cm diameter with centre to centre spacing of 0.9 m. The subsoil consists of clay with unconfined compressive strength of 1.5 kg/cm^2. Determine the efficiency **neglecting the bearing action.** Given : adhesion factor = 0.9.

3. The term "machine foundation" implies any structure under the machine that has been designed to bring the vibrations down to permissible levels. The type of foundation depends on the type of machine. Briefly describe different types of machine foundations.
Barkan's method of analysis of block foundations is based upon the linear theory of weightless spring. Central to the method is the concept of coefficient of elastic uniform compression, C_u. Define the two terms, C_u and k (the spring constant) so as to bring out the difference between them. Establish a relation between the two.