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

PAPER ID : MG8

Roll No. | | | | | | | | | | |

M. TECH. (Sem.II)

THEORY EXAMINATION 2015-16

ANALYSIS OF SETTLEMENTS OF SOILS AND FOUNDATIONS

Time : 3 Hours **Total Marks : 100**

Note : (1) Attempt **all** questions.
(2) All questions carry **equal** marks.
(3) Assume **data** suitably.

1. Attempt any f**our** parts of the following : 5×4=20

(a) Explain how upward flow of seepage water causes the effective stress. What is the role of the pore water pressure in the quick sand condition?

(b) Give the expressions of the equivalent permeability for horizontal and vertical flow of water in soil medium Relate the various methods of determination of coefficient of permeability with the soil types for which they are best suited. How will you find out the permeability in the laboratory through the constant head permeability test?

(c) An anchored sheet pile is to support a mass of cohesion less sort up to height of 6m above G.L. with horizontal anchors spaced at 1m intervals and located at 1.0 m below ground surface .If the unit wt. of soil is 21 kN/m^3 and angle of internal friction is 28^0, determine minimum depth of embedment of sheet pile for stability.

(d) A raft foundation 10 m wide and 12 m long is to be constructed in a clayey soil having a shear strength of 12 kN/m^2. Unit weight of soil is 16 kN/m^3. If the ground surface carries a surcharge of 20 kN/m^2. Calculate the maximum depth of foundation to ensure a factor of safety of 1.2 against base failure. N_c for clay is 5.7.

(e) Explain the principle of design of retaining wall.

(f) What do you understand by the term finite rigid foundation?

2. Attempt any **four** parts of the following : 5×4=20

(a) What is consolidation and compaction? Write down the difference between Consolidation and Compaction.

(b) Differentiate between Terzaghi's and Mayerhof's analysis of bearing capacity.

(c) Calculate the factor of safety with respect to cohesion, of a clay slope laid at 1 in 2 to a height of 10 m, if the angle of internal friction $\Phi = 20^\circ$; c = 30 kN/m^2 and γ = 20 kN/m^2. What will be the critical height of the slope in this soil?

(d) Define modulus of subgrade reaction. How it is estimated?

(e) State the assumptions implied in the use of the Boussinesq's theory to determine the vertical stress in a soil due to a point load and discuss their validity.

(f) What are the factors affecting coefficient of horizontal of subgrade reaction? Explain in detail

3. Attempt any **two** parts of the following : 10×2=20

(a) A clay soil, tested in a consolidometer, showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 0.25 to 0.50 kgf/cm^2. Calculate the coefficient of compressibility ($\mathbf{a_v}$) and the coefficient of volume

compressibility ($\mathbf{m_v}$). If the coefficient of consolidation ($\mathbf{c_v}$) determined in the test for the given stress increment was 10 m^2/year, calculate the permeability in cm/sec. If the sample tested at the site was taken from a clay layer 3.0 m in thickness, determine the consolidation settlement resulting from the given stress increment.

(b) What are the shear strength parameters? What are the laboratory experiments for determination of shearing resistance of the soil? Explain the procedure of triaxial shear test.

(c) How piles are designed to take care of tension? A concentrated load of 40 kN acts on the surface of a soil. Determine the vertical stress increment at points directly beneath the load up to a depth of 10 m and draw a plot for the vertical stress variation up to depth of 10 m

4. Attempt any **two** parts of the following : 10×2=20

(a) How many types of foundation settlements you know? Compute the immediate settlement below the centre of a 4m×4m flexible footing resting at 0.8m depth and applying a stress of 120 kN/m^2 on the following soil deposits. (i)Unsaturated clay of high plasticity with an average undrained strength of 140 kN/m^2 for a depth range of 0-25 below ground surface.

(b) How would you estimate the load carrying capacity of a pile in (i) Cohesion less soil, (ii) Cohesive soil?

(c) A shallow foundation 25×18m carries a uniform pressure of 175kN/m^2. Determine the vertical stress at a point 12m below the mid-point of one of the longer sides (a) using influence factors, (b) by means of New mark's chart

5. Attempt any **one** part of the following : 20×1=20

(a) (i) The following results were obtained from direct shear tests on specimens of a sand compacted to the in-situ density. Determine the value of the shear strength parameter :

Normal stress (kN/m^2)	**50**	**100**	**200**	**300**
Shear stress at failure (kN/m^2)	**40**	**86**	**144**	**254**

Would failure occur on a plane within a mass of this sand at a point where the shear stress is 120 kN/m^2 and the effective normal stress 250 kN/m^2?

(ii) What is Boussinesq equation? Derive the expression for the vertical pressure on any point on the vertical axis passing through the centre of a uniformly loaded circular area.

(b) Briefly discuss about the causes and remedies of tilts and shifts.

A square footing located at a depth of 1.5 m below the ground surface in cohesion less soil carries a column load of 1200 kN. The soil is submerged having effective unit weight of 11.5 kN/m^3 and an angle of shearing resistances of 28^0. Find the size of footing for factors of safety 3. Use general shear failure theory of Terzaghi. Calculate the net bearing capacity of soil also.

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