INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
B.Tech VI Semester End Examinations (Regular) - May, 2019
Regulation: IARE – R16
FOUNDATION ENGINEERING
Time: 3 Hours   (CE)   Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) What is boring? Write a detailed note on various types of boring techniques? **[7M]**

   (b) In a borehole, a layer of fine sand was encountered at a depth of 8m from the ground surface. A dense sand layer overlies the fine sand layer. The N value recorded in the field was 23. Determine the correct N value for the layer at 8m depth. The water table was found to be at a depth of 2m from surface. Take unit weight of dense sand$=21$kN/m^3.

   [7M]

2. (a) What is the purpose of soil investigation? Describe the salient features of a sub soil investigation report. **[7M]**

   (b) A vane used to test a deposit of soft clay required a torque 72 Newton - meter. The vane dimensions are D = 100mm, and H = 200 mm. Determine the value of the undrained cohesion of clay. **[7M]**

UNIT – II

3. (a) Derive the equation to obtain the factor of safety of an infinite dry slope of cohesionless soils.

   [7M]

   (b) A soil mass is resting on an inclined impermeable clay layer. Determine the factor of safety against wedge failure along the interface. The soil has C$=6$kN/m^2, $\phi=20^0$and $\gamma=17$kN/m^3.

   [7M]

4. (a) Define Finite and Infinite slopes. Write about various types of slope failures. **[7M]**

   (b) A vertical cut is made in a clay deposit (C$=30$kN/m^2, $\phi =0^0$, $\gamma=16$kN/m^3). Find the maximum height of the cut which can be temporarily supported. Take $F_c=1$ and $S_n=0.261$. Determine the same when the vertical cut is saturated $\gamma_{sat} = 18$kN/m^3. **[7M]**

UNIT – III

5. (a) Define Active Earth Pressure and Passive Earth Pressure? What are the assumptions of Coulomb's wedge theory? **[7M]**

   (b) A wall 5.4m high, retains sand. In the loose state the sand has void ratio of 0.63 and $\phi=27^0$, while in the dense state, the corresponding values of void ratio and ϕ are 0.36 and 45^0 respectively. Compare the ratio of active and passive earth pressures in the two cases, assume G$=2.64$. **[7M]**

6. (a) Deduce an expression for the active earth pressure of cohesionless soil based on Rankine's theory. **[7M]**

   (b) For the retaining wall shown in Figure 1, determine the lateral earth force at rest per unit length of the wall. Also determine the location of the resultant force. **[7M]**
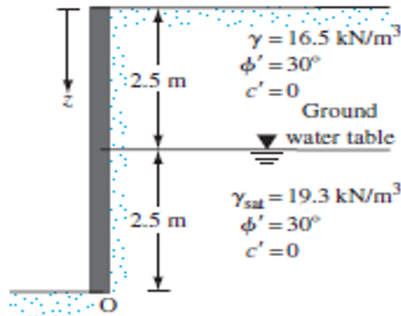

Figure 1

UNIT – IV

7. (a) Enlist the assumptions made in the Terzaghi's bearing capacity theory and differentiate Terzaghi's bearing capacity theory with Meyerhof's theory. **[7M]**

   (b) A pile group of 16 numbers has to be arranged in the form of square in soft clay with uniform spacing. Neglecting end-bearing, determine the optimum value of the spacing of the piles in terms of the pile diameter, assuming a shear mobilization factor of 0.6. **[7M]**

8. (a) What are the various classifications of piles? What are the limitations of Plate Load Test? **[7M]**

   (b) A pile is driven with a single acting steam hammer of weight 15kN with a free fall of 900mm. The final set, the average of the last three blows, is 27.5mm. Find the safe load using Engineering News formula. Take FS=6, Efficiency η=80%. **[7M]**

UNIT – V

9. (a) What are the different measures taken for rectification of shifts and tilts in the sinking of a well? **[7M]**

   (b) A circular well of 4.5m external diameter and 0.75m steining thickness is embedded up to a depth of 12m in a uniform sand deposit. The angle of shearing resistance of sand and the submerged unit weight are 30^0 and 1.0 t/m^3, respectively. The wall is subjected to a resultant horizontal force of 50 tons and a total moment of 400 t-m at the scour level. Assuming the well to be light well, compute the allowable total equivalent resisting force due to earth pressure. A factor of safety of 2 may be adopted for soil resistance. Determine the magnitude and point of maximum bending moment in the wall steining. **[7M]**

10. (a) Write about the various forces considered in the design of well foundations. **[7M]**

    (b) A circular well of 6m external diameter and 4m internal diameter is embedded to a depth of 15m below the maximum scour level in a sandy soil deposit. The well is subjected to a horizontal force of 800kN acting at a height of 8m above the scour level. Determine the allowable total equivalent resisting force due to earth pressure, assuming the rotation is about a point above the base. Take γ_{sat}=20kN/m^3, ϕ=30^0, factor of safety against passive resistance=2. Use Terzaghi's approach. **[7M]**

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