Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012

Subject code: 160606 **Date: 08/01/2013**

Subject Name: Geotechnical Engineering - II

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** A 5*5 square pile group made of concrete of length 20 metre is embedded in cohesive soil (Cu = 50 kPa, γ_t = 16 kN/m^3).Calculate the ultimate load carrying capacity of the pile group if each pile has diameter of 0.5 metre. Take $\alpha = 0.7$. **07**

(b) With a schematic diagram, describe Hiley's formula for calculating the ultimate load carrying capacity. What are its limitations? Giving suitable sketch, describe Pile Load Test and the method of finding the allowable load carrying capacity. **07**

Q.2 **(a)** A 6 metre deep cut is to be made in cohesive soil with a slope of 1:1. The soil has Cu = 30 kPa, $\Phi u = 10.0^\circ$ & γ= 18 kN/m^3 .Find the factor of safety with respect to cohesion. What will be the critical height of the slope in this soil? **07**

(b) Write down step by step the Swedish slip circle method of finding the safety factor for purely cohesive soil and c- Φ soil. **07**

OR

(b) An embankment of height 11 m is made of c- Φ soil having C = 15 kPa, $\Phi = 32.0^\circ$ & γ= 20 kN/m^3 . The slope of embankment is 1.5H:1V. The directional angles are 26.0° & 35.0° respectively. Determine the factor of safety for the slip surface using Swedish method of slices. **07**

Q.3 **(a)** What are the basic assumptions in Boussinesq's theory of stress distribution in soils? Show the vertical stress distribution on a horizontal plane at a given depth and also the vertical stress distribution with depth. What is a pressure bulb? **07**

(b) A reinforced concrete water tank of size 6m*6m & resting on ground surface carries a uniformly distributed load of 200 kPa. Estimate the maximum vertical pressure at a depth of 12 m vertically below the centre of the base. **07**

OR

Q.3 **(a)** Explain stress distribution in soils for concentrated loads by Boussinesq's equation & also explain the concept of Pressure Bulb with neat sketches. **07**

(b) A 4.5 m square foundation exerts a uniform pressure of 180 kPa on a soil. Determine the vertical stress increment at a point 3 m below the foundation and 3.75 m from its centre along one of the axes of symmetry. **07**

Q.4 **(a)** Discuss the various factors that affect the bearing capacity of a shallow footing. Write brief critical notes on settlement of foundations. How do you ascertain whether a foundation soil is likely to fail in local shear or **07**

general shear?

(b) Compute the allowable bearing capacity of a square footing of 2 m size resting on dense sand of unit weight 20 kN/m^3 . The depth of foundation is 1.00 m & the site is subject to flooding. The bearing capacity factors are: $N_c = 55$, $N_q = 38$, $N\gamma = 45$. **07**

OR

Q.4 **(a)** What is meant by bearing capacity of soil? How will you determine in the field? Describe the procedure bringing out its limitations. **07**

Q.4 **(b)** Determine the size of the square footing at the ground level to transmit a load of 900 kN in sand having unit weight 18 kN/m^3 & $\Phi = 36^\circ$ ($N_q = 43$, $N\gamma = 46$). Factor of safety is 3.0. What is the modification in the result, if the footing may be placed at a depth of 1 m below the ground surface? The site is subject to flooding. **07**

Q.5 **(a)** Write short notes on : **07**

(a) Rankine's earth pressure theory,

(b) Active and passive earth pressure.

(b) A masonry retaining wall of trapezoidal section with the vertical face on the earth side is 1.5 m wide at the top and 3.5 m wide at the base and is 5.0 m high. It retains a sand fill sloping at 2 horizontal to 1 vertical. The unit weight of sand is 18 kN/m^3 and $\Phi = 30.0^\circ$. Find the total active thrust on the wall. **07**

OR

Q.5 **(a)** Explain clearly Rebhann's graphical construction method to evaluate the earth pressure on a retaining wall. What are the advantages and disadvantages of Culmann's graphical method as compared to Rebhann's graphical method? **07**

(b) Determine the active & passive earth pressure given the following data: Height of the retaining wall= 10 m; $\Phi = 25.0^\circ$; γ_d = 16 kN/m^3 . Ground water table is at the top of the retaining wall. **07**

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