Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2714301 **Date: 01/01/2016**

Subject Name: Advanced Geotechnical Engineering

Time:2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

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

Q.1 **(a)** What is critical void ratio? How would you determine it in the laboratory? Also explain the conditions causing liquefaction of sand. **07**

(b) Give different types of shear tests based on drainage condition with its suitability for different civil engineering structures. **07**

Q.2 **(a)** A normally consolidated clay specimen was subjected to a consolidated undrained test. At failure σ_3 =100 kN/m^2, σ_1 =204 kN/m^2, and u_d =50 kN /m^2. Determine $Ø_{cu}$ and **Ø.** **07**

(b) What is stress path? Give its importance. Which different stress paths are generally used by engineers? Draw stress path for embankments, excavation, active earth pressure and passive earth pressure. **07**

OR

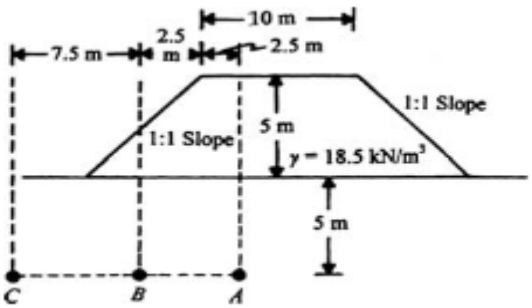
(b) Discuss Terzaghi's theory of consolidation, stating the various assumptions and their validity **07**

Q.3 **(a)** What is the coefficient of consolidation? What is its use in the settlement analysis? How is it determined? **07**

(b) What is pressure bulb? Give its importance in field of geotechnical engineering. Compare the vertical pressure at depths 2.0m and 4.0m directly below a load of 600 kN when (a) load acts as a point load and (b) load is spread over a circular area of radius 1.0 m on surface. **07**

OR

Q.3 **(a)** A 5m high embankment is to be constructed as shown in figure below. If the unit weight of compacted soil is 18.5 kN/m^3, calculate the vertical stress due to the embankment at points A, B and C **07**



(b) Write note on Newmark's Influence Chart **07**

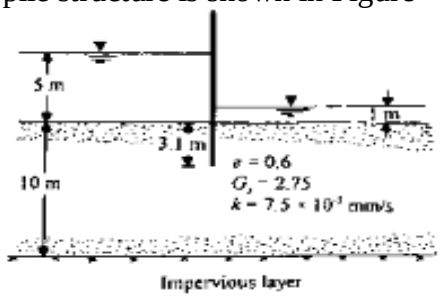
Q.4 **(a)** Soil investigation at a site gave the following information. Fine sand exists to a depth of 10.6 m and below this lies a soft clay layer 7.60 m thick. The water table is at 4.60 m below the ground surface. The submerged unit weight of sand is 10.4 kN/m^3, and the wet unit weight above the water table is 17.6 kN/m^3. The water content of the normally consolidated clay is 40%, its liquid limit 45%, and the specific gravity of the solid particles is 2.78. The proposed construction will transmit a net stress of 120 kN/m^2 at the center of the clay layer. Find the **07**

construction will transmit a net stress of 120 kN/m^2 at the center of the clay layer. Find the average settlement of the clay layer.

(b) Write note on Flow net. **07**

OR

Q.4 **(a)** A single row of sheet pile structure is shown in Figure **07**



(i) Draw the flow net. (ii) Calculate the rate of seepage. (iii) Calculate the factor of safety against piping

(b) Write and explain the Boussinesq's equation for stress distribution in soil for (i) a point load and (ii) Line load. **07**

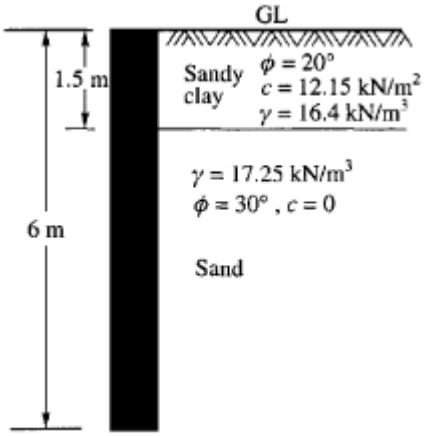
Q.5 **(a)** A drainage pipe beneath a dam has clogged with sand whose coefficient of permeability is found to be 8m/day. The average difference in head water and tail water elevated is 21.2 m, and it has been observed that there is a flow of 162 liters per day through the pipe. The length and c/s area of pipe are 94.3 m and 180 cm^2 respectively. What length of pile is filled with sand? **07**

(b) What do you understand by the "state of general plastic equilibrium"? Explain the concept of active and passive earth pressures with the help of Mohr circle and shear strength envelope. **07**

OR

Q.5 **(a)** What earth pressure theories would you recommend in determining the earth pressures in the case of (i) cantilever retaining wall and (ii) gravity retaining wall? Why? **07**

(b) A rigid retaining wall of 6 m height as shown in figure has two layers of backfill. The top layer to a depth of 1.5 m is sandy clay having ϕ = 20°, c = 12.15 kN/m^2 and γ = 16.4 kN/m^3. The bottom layer is sand having ϕ = 30°, c = 0, and γ = 17.25 kN/m^3. Determine the total active earth pressure acting on the wall and draw the pressure distribution diagram.



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