Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – V (NEW) EXAMINATION – WINTER 2015

Subject Code: 2150609 Date:14/12/ 2015

Subject Name: Soil Mechanics

Time:10:30am to 1:00pm 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)** The following data were recorded while performing the compaction test:- **07**

Water content (%): 7.71 11.5 14.6 17.50 19.50 21.25

Bulk density (kN/m^3): 17.55 19.50 21.0 20.55 20.30 19.80

Plot the MDD-OMC curve and obtain the optimum water content and maximum dry density. Also plot zero air voids curve. Take G = 2.66

(b) State the different types of foundation and mention the factors affecting the selection of type of foundation. **07**

Q.2 **(a)** Compare the 'Direct Shear Test' and 'Triaxial Compression Test'. **07**

(b) Determine the shearing strength parameters from the Direct Shear Test results given below. The proving ring constant is 0.45 kg/Div. **07**

Sr. No.	Normal Stress (kg/cm^2)	Shear Force (Div.)
1.	1.0	110
2.	2.0	140
3.	3.0	200

What would be shearing strength at the normal stress of 10 kg/cm^2?

OR

(b) Explain the different Triaxial tests which can be performed with the different drainage conditions. **07**

Q.3 **(a)** With the help of Terzaghi's Spring Analogy concept, define and explain the phenomenon of consolidation. **07**

(b) (i) Differentiate between 'compression index' and 'swell index' in a void ratio versus log p curve of the consolidation test. **02**

(ii) Differentiate between infinite and finite slopes. How will you calculate the factor of safety for an infinite slope made of cohesive soil? **05**

OR

Q.3 **(a)** Define the term coefficient of consolidation and explain the 'square-root time fitting method' for determination of the same. **07**

(b) (i) During consolidation test, the void ratio decreases from 0.80 to 0.50 under the stress increment of 2.0 kg/cm^2 to 4.0 kg/cm^2. Compute coefficient of compressibility & coefficient of volume compressibility. **02**

(ii) Determine the factor of safety against sliding for a slip surface passing through the toe of a finite slope of height of 11m and slope angle of 1V:1.5H has c= 15 kPa, $\Phi = 32^\circ$ and γ= 20 kN/m^3. The radius & the central angle of the slip circle is 17.4 m & 87^0 respectively. Take ΣN = 1902.74 kN and ΣT = 941.15 kN. Use Swedish slip cirle method. **05**

Q.4 **(a)** (i) A long natural slope in C-Φ soil is inclined at 12° to the horizontal. The water table is at the surface and seepage is parallel to the slope. If a plane slip has developed at a depth of 4.0 m, determine the factor of safety. Take C = 10 kPa, $\Phi = 20^\circ$ & γ_{sat} = 20 kN/m^3. **05**

(ii) For a point load of 150 kN, compute vertical stress at 2.0m depth along the axis by using Boussinesq's and Westergaard's theories. Consider Poisson's ratio = 0.0 **02**

(b) Explain construction of Newmark's Influence Chart and its applications. **07**

OR

Q.4 **(a)** (i) Briefly describe the method of slices for finite slope stability analysis for C-Φ soil. **05**

(ii) Point out the differences between Boussinesq's and Westergaard's theories. **02**

(b) For a point load of 150 kN acting at the ground level, compute the vertical stresses developed on a horizontal plane located at 1.0m depth. Use Boussinesq's theory & compute the stresses for radial distances of 0.0m, 1.0m, 2.0m & 3.0m. **07**

Q.5 **(a)** Briefly explain the conditions of Active earth pressure, Passive earth pressure and Earth pressure at rest. **07**

(b) A retaining wall of height 8.0 m has a horizontal sandy soil as a backfill (C=0.0, $\Phi = 30^\circ$, γ_t = 18 kN/m^3). A surcharge of 50 kPa is acting over the backfill. Draw the active earth pressure distribution and calculate the total active thrust acting on the wall. **07**

OR

Q.5 **(a)** Explain Culmann's graphical method for determination of active earth pressure. **07**

(b) A retaining wall of height 6.0 m has a horizontal backfill with C=30 kPa, $\Phi = 20^\circ$ & γ_t = 20 kN/m^3. Compute the total passive thrust acting on the wall. **07**

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