Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2019

Subject Code: 2150609 **Date: 19/06/2019**

Subject Name: Soil Mechanics

Time: 02:30 PM TO 05:00 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)**	Short Questions 1. The inclination of the failure plane behind a vertical wall in the passive pressure case is inclined to the horizontal at …… . 2. The coefficient of compressibility is the ratio of ……... . 3. For a Standard compaction test, the mass of hammer is …… and the drop of hammer is …… .	**03**
	(b)	What are the purposes of foundation? Also, Discuss briefly, the factors that affect the selection of type of foundation.	**04**
	(c)	What are the different methods of compaction adopted in the field? How would you select the type of roller to be used?	**07**
Q.2	**(a)**	Distinguish between 'active' and 'passive' earth pressure.	**03**
	(b)	A retaining wall 6 m height, with vertical back supports cohesive soil backfill having unit weight 19 KN/m^3, C = 20 KN/m^2 and angle of friction zero. Calculate: (a) Internal pressure intensity at top, (b) Depth of tension crack and (c) Lateral pressure intensity at the base.	**04**
	(c)	A retaining wall 10 m high retains a cohesionless soil having an angle of internal friction of 30^o. The water table is located at depth of 4 m from top surface. The top of the soil is level with top of the wall and is horizontal. If soil carries a uniformly distributed load of 14 KN/m^2.The soil has a bulk unit weight of 15.7 KN/m^3 and saturated unit weight of 19.8 KN/m^3. Sketch the earth pressure diagram under active state and find the total thrust (per unit length of wall) and its location.	**07**
		OR	
	(c)	Explain Culmann's graphical methods for active earth pressure.	**07**
Q.3	**(a)**	What are different factors of safety used in the stability of slopes? Discuss briefly.	**03**
	(b)	A 5 m deep canal has a side slope 1:1. The properties of soil are c = 20 KN/m^2, Ø = 10^o, G = 2.6, e = 0.8. If the Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion, when the canal is running full. Also find the same in case of sudden draw down, if the Taylor's stability number is 0.137 for this condition.	**04**
	(c)	Write notes on the friction circle method of analysing the stability of slopes.	**07**
		OR	
Q.3	**(a)**	Discuss briefly, different types of slope failures.	**03**
	(b)	An embankment is inclined at an angle of 35° and its height is 15 m. The angle of shearing resistance is 15° and the cohesion intercept is 200 kN/m^2. The unit weight of soil is 18.0 kN/m^3. If Taylor's stability number is 0.06, find the factor of safety with respect to cohesion.	**04**

(c) Derive an expression for the factor of safety of an infinite slope in a cohesionless soil. What is the effect of steady seepage parallel to the slope on a stability? **07**

Q.4 **(a)** Explain Modified Mohr Coulomb failure theory for shear strength? **03**

(b) An Unconfined compression test was conducted on an undisturbed clay sample. The sample had a diameter of 38 mm and length 76 mm. the load at failure was 30 N and axial compression of the sample was 11 mm. Determine the undrained shear strength parameters if the failure plane makes an angle 50^o with horizontal. **04**

(c) Describe direct shear test. What are the advantages of this test ? What are its limitations? **07**

OR

Q.4 **(a)** What is Mohr's strength theory for soils? Sketch typical strength envelop for a clean sand. **03**

(b) The following results were obtained in a shear box text. Determine the angle of shearing resistance and cohesion intercept. **04**

Test no.	Total normal stress (kPa)	Total shear stress at failure (kPa)
1	100	98
2	200	139
3	300	180
4	400	222

(c) What are the three standard triaxial shear tests with respect to drainage conditions? Explain with reasons the situations for which each test is to be preferred. **07**

Q.5 **(a)** Define the terms 'Compression index', coefficient of volume change', and 'coefficient of compressibility', and indicate their units and symbols. **03**

(b) A 24 mm thick undisturbed sample of saturated clay is tested in the laboratory with drainage being allowed both through the top and bottom faces. The sample reaches 50 percent degree of consolidation in 45 minutes. If the clay layer from which the sample was obtained is 4.8 m thick and is free to drain through both top and bottom surfaces, calculate the time required by the clay layer to undergo the same degree of consolidation. What would have been the time of consolidation if the clay layer were free to drain only through its top surface? Assume uniform distribution of consolidating pressure. **04**

(c) What is the coefficient of consolidation? Discuss the Square root time fitting method to determine its value, step-by-step. **07**

OR

Q.5 **(a)** State Assumption made in Boussinesq theory. **03**

(b) A ring foundation is of 3.60 m external diameter and 2.40 m internal diameter. It transmits a uniform pressure of 135 kN/m^2. Calculate the vertical stress at a depth of 1.80 m directly beneath the centre of the loaded area using (i) Boussinesq's analysis, (ii) Westergaad's analysis. **04**

(c) Explain the concept of 'Pressure bulb' and its use in soil engineering practice. **07**

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