Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(New) • EXAMINATION – WINTER 2016

Subject Code:2150609 Date:30/11/2016

Subject Name:Soil Mechanics

Time:10:30 AM to 01:00 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 Short Questions 14

1 Consolidation of soil is performed on _____ type of soils.

2 If degree of saturation of a partially saturated soil is 60%, then its air content is

a) 40%
b) 60%
c) 80%
d) 100%

3 The coefficient of active earth pressure for a loose sand having an angle of internal friction of 30° is

a) 1/3
b) 3
c) 1
d) 1/2

4 Select the incorrect statement

a) In a direct shear box test, plane of shear failure is predetermined
b) Better control is achieved on drainage of soil in triaxial compression test
c) Stress distribution on failure plane in case of triaxial compression test is uniform
d) Unconfined compression test can be carried out on all types of soils.

5 Bishop's method of stability analysis

a) Is more conservative
b) Neglects effect of forces acting on sides of the slices
c) Assumes slip surface as an arc of a circle
d) All of the above

6 Time factor for a clay layer is

a) A dimensional parameter
b) A dimensionless parameter
c) Inversely proportional to drainage path
d) Independent of thickness of clay layer

7 Rankine's theory of earth pressure assumes that the back of the wall is

a) Plane and smooth
b) Plane and rough
c) Vertical and smooth
d) Vertical and rough

8 Which of the following is the most accurate method of determination of water content

a) Calcium Carbide Method
b) Alcohol method
c) Oven Drying method
d) Sand Bath Method

9 Unconfined Compressive strength test is

a) Undrained test
b) Drained test
c) Consolidated test
d) Consolidated undrained test

10 Give full forms for (i)UU (ii) CU (iii) CD test

11 Define Earth Pressure at rest

12 Coarse grained soils are best compacted by a

a) Drum roller
b) Rubber tyred roller
c) Sheep Foot Roller
d) Vibratory Roller

13 With increase in the amount of compaction energy

a) OMC increases but MDD decreases
b) OMC decreases but MDD increases
c) Both OMC and MDD increase
d) Both OMC and MDD remain the same.

14 What is pore water pressure?

Q.2 **(a)** Differentiate between standard proctor and modified proctor test. **03**

(b) Explain the various factors affecting compaction. **04**

(c) A soil is compacted in a cylindrical mold with a volume of 1000 cc at **07**

six different water contents, using the same compactive effort (Test 1). After compaction, the samples were extruded and weighed. The same test was repeated with a larger compactive effort (Test 2). The water contents and wet masses of the samples from the two tests are given below. All readings of weight are for wet mass in grams. Plot the water content vs dry density curves and compute MDD and OMC for the two and comment on your findings.

w (%)	11	13	15	17	19	21
Test 1	1867	1956	2044	2106	2090	2036
Test 2	1937	2034	2108	2118	2097	2055

OR

(c) Differentiate between the process of consolidation and compaction. **07**

Q.3 **(a)** Explain One Dimensional Consolidation using Spring Analogy? **03**

(b) Explain with the help of a neat sketch the procedure for determination of preconsolidation pressure? **04**

(c) The following readings were obtained from a consolidation test. Plot the values using square root of time fitting method and calculate the value of coefficient of consolidation if the initial specimen height is 20mm. **07**

$\sqrt{t}$	DDGR	$\sqrt{t}$	DDGR	$\sqrt{t}$	DDGR
0	500	3	133	9	63
0.5	442	4	110	10	51
1	211	5	95	11	40
1.5	178	6	84	12	33
2	154	7	80	13	23
2.5	142	8	76	14	14

OR

Q.3 **(a)** Derive equation for stress distribution of soil under a point load as per Boussinesq's theory. **03**

(b) A water tank is supported by a ring foundation having outer diameter of 10m and inner diameter of 7.5m. The ring foundation transmits uniform load intensity of 160 kN/m^2. Compute the vertical stress induced at a depth of 4m, below the centre of ring foundation, using **04**

(a) Boussinesq analysis, and (ii) Westergaard's analysis, taking μ=0.

(c) Explain Newmark's Chart and its application. **07**

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

(b) Differentiate between Direct Shear Box and Triaxial Test. **04**

(c) A series of direct shear tests was conducted on a soil till failure occurred. The following are the results obtained. Find the shear strength parameters for the soil and find the values of principal stress and angle of principal planes for the normal stress of 0.2kg/cm^2. **07**

Sample No.	Normal Stress (kg/cm^2)	Shear Stress (kg/cm^2)
1	0.25	0.28
2	0.35	0.34
3	0.45	0.38

OR

Q.4 **(a)** Explain various steps in selection of type of foundation for different structures. **03**

(b) Discuss in detail Rehbann's graphical method for determination of earth pressure **04**

(c) Give various objectives for carrying out subsurface exploration. Explain any one type of geophysical exploration method used in field alongwith its applications. **07**

Q.5 **(a)** Derive with the help of a neat sketch the factor of safety for infinite slopes for cohesionless soils (sand). **03**

(b) Explain Taylor's Stability Number in relevant terms. **04**

(c) Explain stepwise procedure for determination of FOS for finite slopes using method of slices **07**

OR

Q.5	**(a)**	Differentiate between active and passive earth pressure with relevant examples.	**03**
	(b)	A masonry retaining wall is 4m high. It has a vertical back with a horizontal sandy backfill upto the top, with a surcharge of 0.85kg/cm^2. Determine the active pressure on the wall for the following condition: water table 1mt below the fill, with sand dry density of 1.85g/cc, moisture content above water table = 12%, angle of internal friction = 30 degree, specific gravity of sand = 2.5, porosity of 30%	**04**
	(c)	Explain Rankine's earth pressure theory for determination of lateral earth pressure under different conditions?	**07**

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