



PRESIDENCY UNIVERSITY, BENGALURU  
SCHOOL OF ENGINEERING

Max Marks: 30

Max Time: 55 Minutes

Weightage: 15 %

Set A

TEST 3

II Semester 2016-2017

Course: CE A 210 Soil Mechanics

21 April 2017

Instructions:

- Write legibly
- Scientific and non-programmable calculators are permitted

Part A

- Answer the following: (1 Q x 8 M= 8 Marks)
  - State and explain the Mohr-Coulomb failure theory stating clearly the assumptions and the equation for the failure envelope.
  - What is meant by Sensitivity and Thixotropy of clay?

Part B

- Answer the following: (1 Q x 10 M= 10 Marks)
  - What are the different types of Triaxial tests?
  - A series of undrained triaxial shear test on samples of saturated soil gave the following results:

Lateral Pressure (KN/m <sup>2</sup> ) $\sigma_3$	100	200	300
Pore water Pressure (KN/m <sup>2</sup> ) $u$	20	50	95
Principle stress difference at failure ( $\sigma_1 - \sigma_3 = \sigma_d$ )	290	400	490

Find the value of Shear strength parameters (a) with respect to Effective stress (b) with respect to the Total stress.

Part C

- Compare Coulumb's and Rankine's Earth pressure Theories.
- A vertical retaining wall of height 6m supports an earthfill. The properties of earthfill are  $C=0$ ,  $\phi=30^\circ$ ,  $G=2.6$  and  $e=0.5$ . The soil surface is horizontal and levelled with the top of the wall. The water table is at a depth of 2m below the top surface. Draw the active earth pressure diagram and determine the magnitude and position of total active earth pressure.



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TEST 2

II Semester 2016-2017

Course: CE A 210 Soil Mechanics

24 March 2017

Instructions:

- i. Write legibly
- ii. Scientific and non-programmable calculators are permitted

Part A

1. Differentiate between:

(2 Q x 4 M= 8 Marks)

- (a) Standard Proctor and Modified Proctor Compaction test
- (b) Compaction and Consolidation.

Part B

2. Define the following:

(3 Q x 4 M= 12 Marks)

- (a) Coefficient of Compression
- (b) Coefficient of Compressibility
- (c) Coefficient of Volume compressibility
- (d) Coefficient of Consolidation

3. What are the assumptions in Terzaghi's theory?

4. What are the factors that affect Compaction? Write down Terzaghi's 1-D consolidation equation. What are the dimensionless parameters we derive from it?

Part C

(1 Q x 10 M= 10 Marks)

5. The following results were obtained in a laboratory compaction test:

Water Content (%)	7.7	11.5	14.6	17.25	19.5	20.2	21.2
Wet Unit Weight (KN/m <sup>3</sup> )	16.67	18.54	19.92	19.52	19.50	19.23	18.83

If the specific gravity of the soil specimen=2.65,

- (1) Draw the compaction curve and find out the Maximum Dry Density(MDD) and Optimum Moisture Content (OMC)
- (2) Draw 100 % saturation line (Z.A.L)



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Set A

TEST 1

II Semester 2016-2017

Course: CE A 210 Soil Mechanics

25 February 2017

Instructions:

- Write legibly
- Scientific and non-programmable calculators are permitted

Part A

(2 Q x 4 M = 8 Marks)

- With the help of phase diagram, define the terms void ratio, porosity, water content and degree of saturation.
- Derive the relation between void ratio, water content specific gravity and degree of saturation.

Part B

(2 Q x 5 M = 10 Marks)

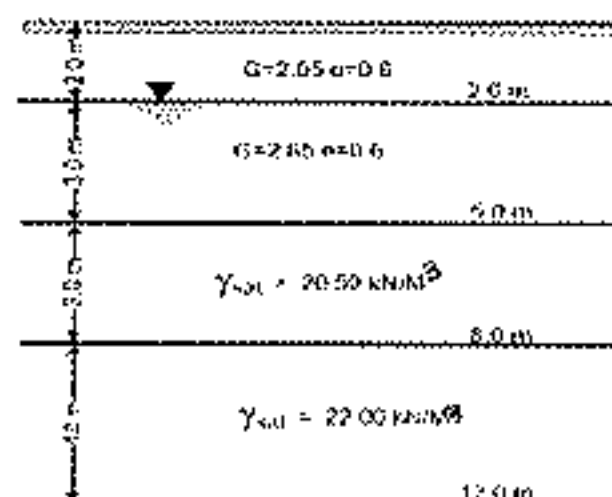
- An undisturbed saturated specimen of clay has a volume of  $106 \times 10^3 \text{ mm}^3$  and mass of 1.928 N. On oven drying, the mass reduced to 1.46 N. The volume of the dry specimen as determined by displacement of mercury is  $77.4 \times 10^3 \text{ mm}^3$ . Determine the shrinkage limit, initial and final void ratios. Take  $e = 2.7$ .
- A constant head permeameter contains a soil sample of 20cm length,  $25\text{cm}^2$  under a head of 40cm. The discharge was found to be 180cc in 110 seconds. The specific gravity of the grain is 2.66. Determine the coefficient of permeability, superficial velocity, seepage velocity and co-efficient of percolation if void ratio is 0.5.

Part C

(2 Q x 6 M = 12 Marks)

- A soil profile is as shown in the figure. Plot the distribution of total stress, pore pressure and effective stress up to a depth of 12m.

Figure 1:

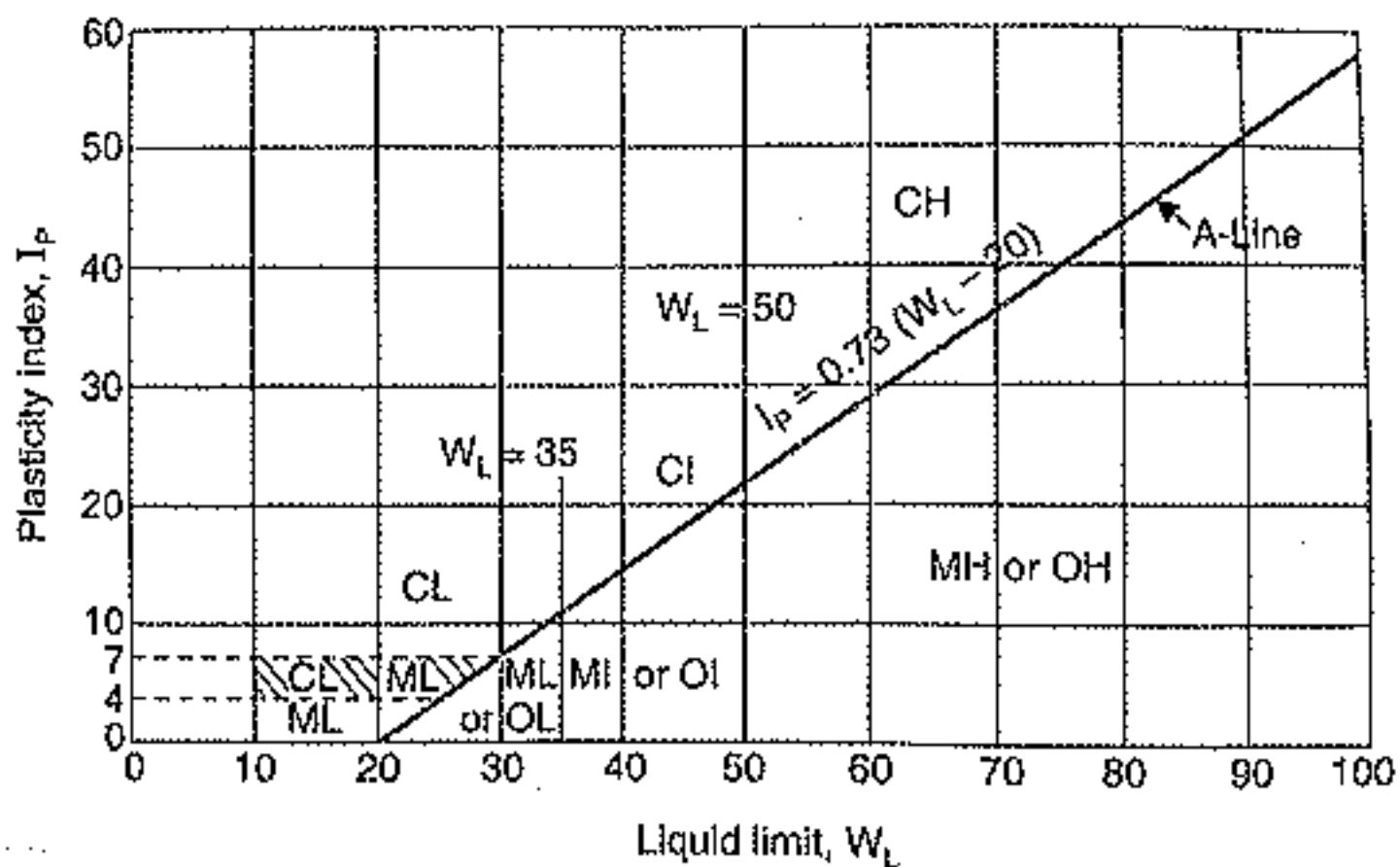


6. Classify soils on the basis of the data provided, as per IS:1498-1970. Where additional information is required, say what data is needed?

Soil	$W_L$	$W_P$	% passing through 75 $\mu$ sieve	% gravel >4.75mm	% sand 4.75mm - 0.075mm
A	60	30	90	0	10
B	--	Non-Plastic	100	0	0
C	35	20	20	60	20

Figure 2:

Plasticity Chart



Plasticity chart as per Indian Standard Soil Classification System