



# VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

[Central Technological Institute, Maharashtra state]

Matunga, Mumbai-400019

SEMESTER EXAMINATION

MAY 2012

DATE OF EXAM: 14/05/12

SEMESTER & COURSE

IV SYBTECH-(CIVIL)

Time:- 1:30 To 4:30

TIME ALLOWED

3HRS

SUBJECT(Code):

SOIL MECHANICS (0225)

MAX MARKS : 100

## Instructions:

- All questions are compulsory.
- Figures to the right indicate full marks.
- Assume suitable data if necessary.
- Illustrate your answers with neat sketches wherever necessary.

Q.1 Answer the following

a. Derive the following relationship

4

$$\gamma_{sat} = \gamma_w \left( \frac{G+e}{1+e} \right) \quad \text{and} \quad \gamma_d = \frac{G\gamma_w}{1+e} \quad \text{with usual notations.}$$

b. Compare energies given in standard proctor and modified proctor tests.

4

c. Calculate time required in years for 90% consolidating a clay layer of 5 m depth surrounded by sandy silt. The  $C_v$  value is  $0.000256 \text{ cm}^2/\text{s}$ .

4

d. In shear test if  $\alpha = 50^\circ$ ,  $\sigma = 20 \text{ kPa}$ ,  $c = 10 \text{ kN/m}^2$ . Determine  $\phi$  and shear strength.

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e. If  $k_1$  is the permeability at  $e_1$  void ratio. Determine the  $k_2$  at void ratio  $e_2$ .

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Q.2 a. Discuss field identification methods for fine grained soil.

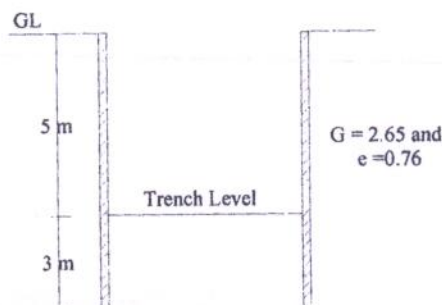
6

b. An undisturbed specimen of clay has volume of  $18.9 \text{ cm}^3$  and mass of 30.2 g. On oven drying mass reduces to 18 g. The mass mercury displaced by dry soil pat 134.64 g. Determine the shrinkage limit, specific gravity shrinkage ratio and volumetric shrinkage.

8

c. Can clayey soil undergo quick condition? Check the stability against quick condition of side support as shown in Fig.1. If yes what is the remedy.

6



P.T.O

- Q.3 a. Show that average permeability ( $k_x$ ) parallel to bedding plane is greater than average permeability perpendicular ( $k_y$ ) bedding plane. Write any one field determination of permeability test. 6
- b. Write applications of flow net. 4
- c. Draw dry density moisture content curve and find out MDD and OMC tested in standard proctor test using small mould (1000 cc capacity) and light hammer. Also find maximum theoretical density at  $w=15.5\%$ , if  $G = 2.7$  10

Compacted wt of soil, gm	1800	1940	2000	2005	2003	1980
Water content, %	8.5	12.2	13.75	15.5	18.2	20.2

- Q.4 a. Derive the relationship between major and minor principle stresses. Modify the same for unconfined compression strength condition. 6
- b. Evaluate effective shear parameters from the results of CU test 8

Cell pressure, kPa	150	300	450	600
Deviator stress, kPa	102	200	304	405
Pore water pressure, kPa	80	164	264	325

- c. Explain types of slope failure in embankment. 6
- Q.5 a. Discuss any one graphical method of evaluation of  $C_v$ . 4
- b. A clay soil tested in consolidation cell showed void ratio decreases from 1.2 to 1.10 when the pressure was increased from 0.25 to 0.50  $\text{kg/cm}^2$ . Calculate coefficient of compressibility, coefficient of volume change. If coefficient of consolidation is 10  $\text{m}^2/\text{yr}$  of a 5 m thick sample surrounded by sandy deposits, evaluate the time required for 90% consolidation. Also evaluate the settlement by using  $\Delta H/H = H(\Delta e/1+e)$ . 10
- c. Write symbols with description of fine grained soil. Write steps to classify SP-SM according to I.S. classification. 6