

# Paper ID [CE304]

(Please fill this Paper ID in OMR Sheet)

**B.Tech. (Sem. - 6<sup>th</sup>)**

## GEOTECHNICAL ENGINEERING (CE - 304)

Time : 03 Hours

Maximum Marks : 60

### Instruction to Candidates:

- 1) Section - A is Compulsory.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C

### Section - A

Q1)

(10 × 2 = 20)

- a) Name the process and agencies responsible for formation of fine grained soils.
- b) Given:  $D_{10} = 0.1$  mm,  $D_{30} = 0.41$  mm,  $D_{60} = 0.62$  mm  
Write down soil classification as per 1498-1970.
- c) If  $w = 40\%$ ,  $G = 2.71$ ; then calculate  
 $\gamma_{sat}$  and  $\gamma_{dry}$  in  $\text{kN/m}^3$ .
- d) Give complete name of soil groups:  
SM, GW-GM
- e) Which type of roller is the most suitable for compacting subgrade with high plastic clays?
- f) Draw a typical consolidation curve for laboratory consolidation test on undisturbed soil samples.
- g) Distinguish between seepage and discharge velocities through soil.
- h) Draw typical stress-strain curves for sandy soils.
- i) Define Skempton's pore pressure parameters.
- j) Differentiate between active and passive earth pressure.

## Section - B

(4 × 5 = 20)

- Q2) How do you find out equivalent permeability for flow perpendicular to stratification in the soils? Derive the expressions for it.
- Q3) A cohesive soil has unit weight of  $19.2 \text{ kN/m}^3$ , unit cohesion  $12 \text{ kN/m}^2$  and  $\Phi = 10$  degree. Calculate the critical depth of vertical excavation that can be made without any lateral support.
- Q4) Enumerate the advantages of tri-axial shear strength tests.
- Q5) An embankment for a highway is to be constructed from a soil compacted to a dry unit weight of  $18 \text{ kN/m}^3$ . The soil has to be trucked to the site from a borrow pit. The bulk unit weight of soil in the borrow pit is  $17 \text{ kN/m}^3$  and its natural water content is 50%. Calculate the volume of the soil from the borrow pit required for one cubic meter of embankment. ( $G=2.7$ )
- Q6) Give the structure and characteristics of montmorillonite clay minerals.

## Section - C

(2 × 10 = 20)

- Q7) The results of two drained triaxial tests on saturated clay are given as

Specimen I:  $\sigma_3 = 69 \text{ kN/m}^2$

$\sigma_d = 213 \text{ kN/m}^2$

Specimen II:  $\sigma_3 = 120 \text{ kN/m}^2$

$\sigma_d = 258.7 \text{ kN/m}^2$

Calculate shear strength parameters of the soil.

- Q8) A retaining wall 3 m high supports a dry cohesion-less backfill with a plane ground surface sloping upwards at a surcharge angle  $10^\circ$  from the top of wall. The back of wall is inclined to the vertical at a positive batter angle of  $8^\circ$ . Assuming an angle of wall friction  $20^\circ$ , determine the total active earth pressure and pressure distribution.

(Given  $\gamma_{\text{backfill}} = 19 \text{ kN/m}^3$ ,  $\Phi = 30^\circ$ )

- Q9) Write short notes on the following:

- (a) Zero air-void line and its significance.
- (b) Logarithmic time fitting method.