Paper ID [CE304]

B.Tech. (Sem. - 6th)
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) $(10 \times 2 = 20)$

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

   γ_{sat} and γ_{dry} in kN/m³.

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

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 kN/m³, unit cohesion 12 kN/m² 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 kN/m³. 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 kN/m³ 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 montmorilonite clay minerals.

Section - C

$(2 \times 10 = 20)$

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

Specimen I: $\sigma_3 = 69$ kN/m²
$\sigma_d = 213$ kN/m²
Specimen II: $\sigma_3 = 120$ kN/m²
$\sigma_d = 258.7$ kN/m²

Calculate shear strength parameters of the soil.

Q8) A retaining wall 3 m high supports a dry contusion-less backfill with a plane ground surface sloping upwards at a surcharge angle 10° from the top of wall. The back of wall is inclined to the vertical at a positive batter angle of 8°. Assuming an angle of wall friction 20°, determine the total active earth pressure and pressure distribution.
(Given $\gamma_{backfill} = 19$ kN/m³, $\Phi = 30°$)

Q9) Write short notes on the following:

(a) Zero air-void line and its significance.

(b) Logarithmic time fitting method.