Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (CE)   (Sem.–6)
GEOTECHNICAL ENGINEERING
Subject Code : CE-304

Paper ID : [A0619]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. **Check whether following statements are true or false. Explain with reasoning.**

   a) Cohesionless soils are best suited as backfill material.

   b) Hydrometer analysis is applicable for particles sizes ranging between 0.2 mm and 0.0002 mm.

   c) For a given soil, the coefficient of permeability increases with decrease in void ratio.

   d) The effective stress at various points decreases due to lowering in water table.

   e) The field consolidation curve is same as lab consolidation curve.

   f) Isobars are lines of equal stress.

   g) The pore water pressure during a shear test on normally consolidated clay is negative.

   h) In unconfined compression test, the failure envelope is inclined.

   i) The soils compacted dry of optimum have higher compressibility than those on wet side.

   j) In CU test, only total stress parameters are obtained.

SECTION-B

2. 50g of soil passing through 75 micron, oven dried soil was used in a hydrometer analysis. The hydrometer reading after commencement of sedimentation test is 24.5. The effective depth for $R_h = 24.5$ found from the calibration curve is 10.7cm. $C_m = +0.5$. $G = 2.75$, $\eta = 0.008$ poise. Calculate the smallest particle size which would have settled during this interval of 30 minutes and % of particles finer than this size.

3. Calculate the equivalent of the system when flow is in parallel and perpendicular to bedding planes. The details of bedding planes are as under :

Layer no.	Thickness (m)	Permeability (cm/sec)
1	2m	0.2
2	1m	3×10^{-4}
3	1.5m	0.06
4	3m	5×10^{-7}

4. What is the effect of compaction on shear strength, permeability, compressibility and swelling of soils?

5. A 4m high embankment with a top width of 8m and side slopes of 1.5:1 has to be constructed by compacting soil from a nearby borrow pit. The unit weight and natural moisture content of soil are 16 kN/m^3 and 10% respectively. Determine the volume of earth to be excavated from the borrow pit and quantity of water to be added to it for every km of finished embankment, if the required dry density and moisture content of embankment soil be 19 kN/m^3 and 16.5% respectively. Given $G = 2.70$

6. Compare the process of compaction with consolidation.

SECTION-C

7. The following time-dial reading data was obtained from a consolidation test on a saturated clay sample under a stress increment from 200 to 400kN/m^2. Least Count = 0.002mm :

Time (min)	0	0.25	1	2.25	4	9	16	36	64	100	1440
Dial Reading (Div)	1972	1921	1870	1848	1813	1769	1727	1642	1555	1491	1449

The initial thickness of sample was 25mm and its end of test water content was 28% and $G = 2.68$.

a) Determine c_v.

b) Estimate the time required for 50% consolidation to occur if 3m thick clay is there in the field having sandwiched between the sand layers.

8. Two triaxial tests conducted on identical specimens. In the first test, cell pressure is 120kPa and specimen failed under a deviator stress of 480kPa. In the second test, cell pressure is 250kPa and specimen failed under a deviator stress of 618kPa. Determine the shear strength parameters. If a third identical specimen of soil is tested under a cell pressure of 350kPa, what will be major principal stress at failure?

9. For a retaining wall, the following data was available :

Height of wall = 7m, Density of backfill = 16 kN/m^3, $\Phi = 35°$, $\delta = 20°$, back of wall is inclined at 20° to vertical (+ve batter), backfill surface is sloping at 1:10. Determine the magnitude of active earth pressure and passive earth pressure by Rebann's graphical method.