

1. Answer any five questions.
2. Maintain neatness. Assume reasonable value of data if it is not supplied.
3. All drawings-must be drawn by pencil. Do not retain mobile phone during examination.
4. No code etc. will be needed to answer the questions of this part

No. of Question		Marks												
(1)(a)	What happens in the three phase system when the water content is reduced below Shrinkage Limit?	3												
(b)	A soil sample has a volume of 160cc and a weight of 290 gm when partially saturated and 227 gm when dry. The specific gravity of solid particles is 2.65. Determine water content, degree of saturation, Bulk Density when partially saturated and Dry Density.	10												
(c)	Compare qualitatively the consistency, shear strength, compressibility of the following soils with justification:	7												
	<table border="1"> <thead> <tr> <th></th> <th>Soil A</th> <th>Soli B</th> </tr> </thead> <tbody> <tr> <td>LL (%)</td> <td>62</td> <td>48</td> </tr> <tr> <td>PL (%)</td> <td>21</td> <td>17</td> </tr> <tr> <td>Natural moisture content(%)</td> <td>42</td> <td>35</td> </tr> </tbody> </table>		Soil A	Soli B	LL (%)	62	48	PL (%)	21	17	Natural moisture content(%)	42	35	
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(2)(a)	State and illustrate Darcy's Law by a neat sketch in connection with flow of water through soil	5												
(b)	The water table in a certain deposit of soil is at a depth of 3.0 m below GL. The soil consists of soft silty clay down to 6.5 m below GL. This is followed by a 4.5 m thick sand stratum. Which overlies a stiff silty clay layer of 7m thickness. The soil above the water table is saturated. Given that for top and bottom clay strata moisture content = 36% and 27% respectively, Specific gravity of clay = 2.70 for both the strata, and for sand moisture content = 21%, G= 2.64. Find the distribution of total, effective stress and pore-water pressure down to 18m below GL. What will be the change in effective stress, if the water table is brought down by 1.5 m?	15												
(3)(a)	Define 'shear strength of soil' and illustrate Mohr Coulomb failure theory.	8												
(b)	An un-drained tri-axial test was conducted on a silty clay sample and the following results were obtained:	12												
	<table border="1"> <tbody> <tr> <td>Cell Pressure (kN/ m²)</td> <td>50</td> <td>100</td> </tr> <tr> <td>Deviator Stress at failure (kN/ m²)</td> <td>145</td> <td>247</td> </tr> </tbody> </table>	Cell Pressure (kN/ m ²)	50	100	Deviator Stress at failure (kN/ m ²)	145	247							
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	Find out the shear strength parameters of the soil from the two tests and also find the deviator stress for a cell pressure of 200kN/m ² .													
(4)(a)	Deduce Laplace equation in respect of seepage of water through soil.	10												
(b)	The coefficient of permeability of a soil sample was found out in a soil mechanics laboratory by making use of a falling head permeameter. The data obtained were as follows: Diameter of sample= 10 cm, height of sample = 15 cm, diameter of stand pipe = 1.5 cm, initial head = 50 cm, final head after lapse of a time duration of 2 minutes = 30 cm. Find the head after lapse of 1 minute more.	10												
(5)(a)	Why compaction process is considered to be occurred mainly due to expulsion of the air?	6												
(b)	How the effective stress is being affected with progress of the consolidation process?	4												

Use a separate Answer-Script for each part

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- (5)(c) A proctor compaction test was conducted on a soil sample, and the following 10 observations were made:

Water content, percent	7.7	11.5	14.6	17.5	19.7	21.2
Mass of wet soil, g	1739	1919	2081	2033	1986	1948

If the volume of the mold used was 950 cm^3 and the specific gravity of soils grains was 2.65, make necessary calculations and draw, (i) compaction curve and (ii) 80% and 100% saturation lines.

- (6)(a) What are the assumptions made in stokes law? 2 + 5
Illustrate "Meniscus Correction" in relation to hydrometer test with the help of a neat sketch.

- (b) A 500 g sample of dry soil was used for a combined sieve and hydrometer analysis 8
(152 H type hydrometer). The soil mass passing through the 75μ sieve = 120 g. and was collected in the steel pan, out of which 50 gm was taken and a 1 litre suspension was made by adding distilled water and dispersing agent to it in a measuring cylinder having a diameter of 6015 cm. the volume of the hydrometer was 50 cc, the height of the bulb was 1505 cm and the length of the calibration on the stem 9.7 cm. the minimum and maximum marks on its stem were 990 and 1040 respectively. A hydrometer test was then performed at the room temperature at 25^o C and the following readings were recorded:

Elapsed time (min)	1/2	1	2	4	8	15	30	60
Reading	1024	1023	1020	1018	1014	1011	1006	1001

When the hydrometer was immersed in distilled water containing the same quality of dispersing agent as that present in the suspension, the reading was found out to be 999.5. At 25^o C, the unit weight of water is 0.9971 gm/ cc and its viscosity is 8.95 milli-poise. $G = 2.67$. Meniscus correction = 0.5.

Find out the diameter of particles settled corresponding to each hydrometer reading and the respective % finer values.

- (c) Deduce the formula for finding per cent finer corresponding to a particular hydrometer reading. 5

END