Class Test-I Solution

Subject : Soil Mechanics-I

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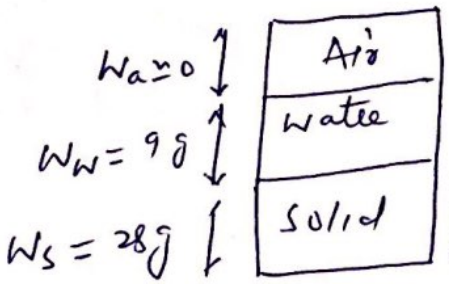
Q-1 (δ) $W_s = 28\,g$, $V_V = 10\ cm^3$

$W_W = 9\,g$, $G_s = 2.7$



$\therefore G_s = \frac{\gamma_s}{\gamma_w} \Rightarrow \frac{W_s}{V_s} = G_s \gamma_w = 2.7 \times 1 = 2.7$

$V_s = \frac{28}{2.7}$

Water Content $(W) = \frac{W_W}{W_S} \times 100 = \frac{9}{28} \times 100$

Void ratio $(e) = \frac{V_V}{V_s} = \frac{10 \times 2.7}{28}$

Degree of saturation $(S_r) = \frac{V_W}{V_V} = \frac{9}{10} \times 100$

$\because \gamma_w = \frac{W_W}{V_W}$

$V_W = \frac{W_W}{\gamma_W} = \frac{9}{1} = 9\ cc$

Porosity $(\eta) = \frac{e}{1+e} = \frac{\frac{10 \times 2.7}{28}}{1 + \frac{10 \times 2.7}{28}} = \frac{10 \times 2.7}{28 + 10 \times 2.7}$

Hence A, B and D are Correct.

Q-2 (28.60 %)

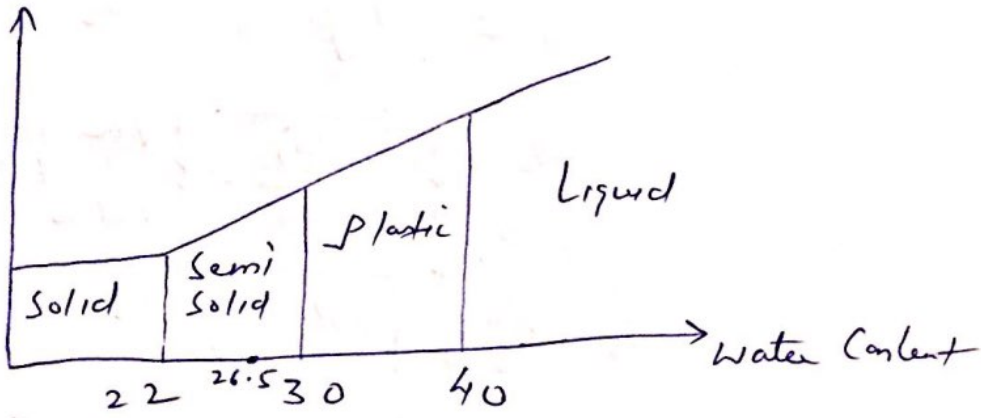
$$w = 30 - \log_{10} N$$

This is the equation of flow curve.

Liquid Limit is defined as the water content at 25 blows

$$w_L = 30 - \log_{10} 25 = 28.60\ \%.$$

Q-3 (Semi solid) Vol



Natural water content = 26.5 %.

∴ Soil is in semi solid state

Q-4 (117.86 %) For a uniform spherical particle

$$e_{max} = 0.91$$

$$e_{min} = 0.35$$

$$e_{hat} = \frac{0.2}{1-0.2} = \frac{0.2}{0.8} = 0.25$$

$$\text{Relative density } (I_D) = \frac{e_{max} - e_{hat}}{e_{max} - e_{min}} \times 100$$

$$= \frac{0.91 - 0.25}{0.91 - 0.35} \times 100 = 117.86\ \%.$$

Q-5 (1.2)

Sieve size	Wt of soil retained (gm)	% Wt of soil retained	% Cummulative wt retained	% finer
600 μ	200	40	40	60
500 μ	250	50	90	10
425 μ	50	10	100	0
Total =	500 gm			

$$C_u = \frac{D_{60}}{D_{10}} = \frac{600}{500} = 1.2$$

Q-6 (2.77) $G_m = 1.9$

↳ For fully saturated specimen

$$G_m = \frac{\gamma_{sat}}{\gamma_w} = \frac{G+e}{1+e} = \frac{G+wG}{1+wG}$$

$$1.90 = \frac{G + 0.35G}{1+0.35G}$$

$$\boxed{G = 2.77}$$

Q-7 (a) (Y)

Soil transported by Wind → Aeolian soil

soil transported by Water → Alluvial deposit

Soil " " Lake → Lacustrine Soil

soil " " Ice → Glacial deposit

(b) (0.60)

$w_L = 60\%$, $w_p = 35\%$, $w_s = 20\%$.

$w_A = 50\%$.

Liquidity Index (I_L) $= \frac{w_A - w_p}{w_L - w_p} = \frac{50 - 35}{60 - 35}$

$= \frac{15}{25} = 0.60$

Q-8 (a) (40 %)

$S_r = 60\%$

$a_c + S_r = 1$

$a_c = 1 - S_r = 1 - 0.60 = 0.40$

∴ Air Content (a_c) = 40 %.

(b) (21.26 %)

$w_s = 10\%$.

$G_s = 2.7$

$w_s = \frac{e}{G} = \frac{e}{2.7} \Rightarrow e = 2.7 \times 0.1$

$e = 0.27$

~~$e = 2.7 \times 0.1 = 0.27$~~

$e = \frac{\eta}{1-\eta}$ or $\eta = \frac{e}{1+e} = \frac{0.27}{1.27} \times 100$

Porosity (η) = 21.26 %.

Q-9 (B)

	Soil A	Soil B	Soil C	Soil D
w_L	50	49	43	47
w_p	23	17	21	26
I_p	27	32	22	21

Since Soil B has higher value of Plasticity Index. Hence Soil B contains more clay particles

Q-10. (d)

$w_L = 45\%$, $w_p = 25\%$.

$w_s = 17\%$, $w_a = 30\%$.

Consistency Index $(I_c) = \dfrac{w_L - w_a}{w_L - w_p}$

$= \dfrac{45 - 30}{45 - 25} = \dfrac{15}{20}$

< END OF THE SOLUTION >

NOTE: If Any Doubts, Please Mail on www.talktorashid@keck.ac.in