A3 given data :-

$w = 20\% = 0.2$

$\gamma_b = 1.8\ g/cc$

$\gamma_w = 1\ g/cc$

$G_s = 2.65$

S, e = ? sample is partially saturated.

(a) $\gamma_b = \frac{(G_s + Se)\gamma_w}{1+e}$ Note $Se = G_s w$

or, $\gamma_b = \frac{(G_s + G_s w)\gamma_w}{1+e}$

or, $1+e = \frac{(G_s + G_s w)\gamma_w}{\gamma_b}$

or, $e = \frac{(G_s + G_s w)\gamma_w}{\gamma_b} - 1$

or, $e = \frac{(2.65 + 2.65 \times 0.2) \times 1}{1.8} - 1$

$e = 1.766 - 1$

$\boxed{e = 0.767}$ ans.

(b) now, $Se = G_s w$

$S = \frac{G_s w}{e}$

$S = \frac{2.65 \times 0.2}{0.767}$

$S = 0.691$

$\boxed{S = 69.1\%}$ ans.

Q1

given data :-

Saturated clay $S = 1$

weight $W = 15.45\,g$

moisture content $\omega = 38\% = 0.38$

Specific gravity $G_s = 2.70$

(a) void ratio, e $\quad Se = G_s \omega$

$$e = \frac{G_s \omega}{S}$$

$$e = \frac{2.70 \times 0.38}{1}$$

$$\boxed{e = 1.026}$$ ans.

(b) porosity, n $\quad n = \frac{e}{1+e}$

$$n = \frac{1.026}{1+1.026}$$

$$n = 0.506$$

or $\boxed{n = 50.6\,\%}$ ans.

(c) dry unit wt, $\gamma_d \quad \gamma_d = \frac{G_s \gamma_w}{1+e}$

$$= \frac{2.70 \times 1}{1+1.026}$$

$$\boxed{\gamma_d = 1.332\ g/cc}$$ ans.

(d) bulk unit wt γ_b, $\gamma_b = \frac{(G_s + Se)\gamma_w}{1+e} = \frac{(2.70 + 1 \times 1.026)}{1+1.026} \times 1$

$\gamma_b = 1.839\ g/cc \Rightarrow \boxed{\gamma_b = 1.84\ gm/cc}$ ans.

Q6 Given data :

specific gravity $G_s = 2.65$

Porosity $n = 40\% = 0.4$

$\gamma_w = 1 \text{ g/cc}$

void ratio, $e = \frac{n}{1-n}$

$$e = \frac{0.4}{1-0.4}$$

$$e = \frac{0.4}{0.6} = 0.67$$

(a) dry unit weight, $S = 0$

$$\gamma_d = \frac{G_s \gamma_w}{1+e}$$

$$= \frac{2.65 \times 1}{1+0.67}$$

$$\gamma_d = 1.586 \simeq 1.59 \text{ g/cc} \quad \text{ans.}$$

(b) γ_{sat} (unit weight of sample when fully saturated) $S = 1$

$$\gamma_{sat} = \frac{(G_s + Se)\gamma_w}{1+e}$$

$$= \frac{(2.65 + 1 \times 0.67) \times 1}{1+0.67}$$

$$= 1.988 \text{ g/cc}$$

$$\gamma_{sat} \simeq 1.99 \text{ g/cc} \quad \text{ans.}$$

(c) Submerged unit weight, $\gamma_{sub} = \gamma_{sat} - \gamma_w$

$$= 1.99 - 1$$

$$\gamma_{sub} = 0.99 \text{ g/cc} \quad \text{ans}$$

(d) bulk unit weight when degree of saturation is 50%.

$$S = 50\% = 0.5$$

$$\gamma_b = \frac{(G_s + Se)}{1+e}\gamma_w$$

$$= \frac{(2.65 + 0.5 \times 0.67)}{1 + 0.67} \times 1$$

$$\gamma_b = 1.787 \text{ g/cc} \quad \text{ans.}$$

Q1 A soil has a bulk unit weight of 20.11 kN/m³, and water content of 15%. calculate the water content if the soil partially dries to a unit weight of 19.42 kN/m³ and the void ratio remains unchanged.

Q2 A saturated specimen of undisturbed inorganic clay has a volume of 19.2 cm³ and mass 32.5gm. after oven drying at 105°C for 24hr the mass reduces to 20.9 gm. For the soil in the natural state find (i) w (ii) G_s (iii) e (iv) γ_{sat} (v) γ_d

Q3 In a jodhpur mini-compactor test 6.12gm of wet soil occupies a volume of 300 cm³ at a moisture content of 12.6%. Determine (i) γ (ii) γ_d (iii) e (iv) n (v) S_r in the compacted soil if the specific gravity of soil solid is 2.68.

Q4 A compacted sample of soil with a bulk unit weight of 19.62 kN/m³ has a water content of 15%. what are its dry density, degree of saturation and air content. assume $G_s = 2.65$.