Q1/A: What are purposes of irrigation

Q1/B: Given a soil sample with a total volume of 125cm^3, total weight of 2N, and weight of solids of 1.6N

The 1st layer: After all gravity water has been drained out the soil weight become 2.1N, initial water content is 31.177% by weight, & permanent wilting point is 20% by vol. RZ=40cm

The 2nd layer: Field capacity is 20% by vol, initial water content is 15% by vol, & permanent wilting point is 20% by vol. RZ=40cm

After adding 10cm of water to the soil find soil moisture content for the second layer by vol, by weight, & by mm

Q2/A: if the infiltration depth at the beginning of irrigation run is 50mm when the water front reach a distance 170m of border length, & it become 80mm when the water front reach 250m distance. If the instantaneous infiltration rate is $\mathbf{I=0.25t^{-0.5}}$(cm/min). Find the depth of infiltration at a distance of 120m from the beginning of irrigation run when water front reach 300m

Q2/B: Water is applied to a farm of total area 3000 Donum once every week. The applied water depth is 90mm, conveyance efficiency 60%, and the water losses is 3000 lit/min/100N. ha. The percent of useful discharge that stored in the root zone to the total discharge is 50%. Find water duty in N.ha/G.m^3/sec

Q1B

$$V_w = \frac{W_w}{\gamma_w} = \frac{(2.1 - 1.6) * 10^6}{9810} = 50.97 \text{ cm}^3$$

$$w_{F.C} = \frac{V_w}{V} = \frac{50.97}{125} \times 100 = 40.78\% \text{ by vol.}$$

$$Smd = F.C - iwc$$
$$= 40.78 - 31.177 * G_b$$

$$\gamma_b = \frac{W_s}{V}$$

$$\gamma_b = \frac{1.6 \times 10^6}{125} = 12800 \text{ N/m}^3$$

$$G_b = \frac{\gamma_b}{\gamma_w} = \frac{12800}{9810} = 1.3$$

$$\therefore smd = 40.78 - 31.177 * 1.3$$
$$smd = 0.25\% \text{ by vol.}$$

$$smd_{\text{after adding 10 cm}} = 10 - 0.25 \times 40 = 0$$

$$\therefore iwc_{\text{for 2nd layer}} = 15\% \text{ by vol.}$$

$$iwc = \frac{15}{100} * 1.3 = 0.195 \text{ by weight}$$

$$iwc = 0.15 \times 40 \times 10 = 60 \text{mm}$$

Q2 A

$D = \int \dot{s}\, dt$

$= \int 0.25\, t^{-0.5} = \frac{0.25\, t^{0.5}}{0.5} = 0.5\, t^{0.5}$

$D_{cm} = 0.5\, t_{min}^{0.5}$ —— (1)

for $X = 170$, $D = 50\,mm$ sub in (1) &

for $X = 250$ $D = 80\,mm$ sub in (1)

$5 = 0.5\, t^{0.5} \Rightarrow t = 100\,min$ (for $X = 170\,m$)

$8 = 0.5\, t^{0.5} \Rightarrow t = 256\,min$ (for $X = 250\,m$)

$X = a\, t^{b}$

$170 = a\, 100^{b}$ —— (2)

$250 = a\, 256^{b}$ —— (3)

$3 \div 2$ $1.471 = 2.56^{b}$

$b = 0.411$ $a = 25.61$

$X = 25.61\, t^{0.411}$

$120 = 25.61\, t^{0.411} \Rightarrow t = 42.86\,min$

$300 = 25.61\, t^{0.411} \Rightarrow t = 398.36\,min$

) sub in eq (1)

$D = 0.5\,(398.36 - 42.86)^{0.5}$

$D = 9.43\,cm.$

Q 2 B

$$\frac{Q_u}{Q_t} = 0.5$$

$$Q_u = 0.5\, Q_t$$

$$CE = \frac{Q_g}{Q_t}$$

$$0.6 = \frac{Q_g}{Q_t} \Rightarrow Q_g = 0.6\, Q_t$$

$$Q_g = Q_u + losses + \cancel{L.R}^{0} - \cancel{rainfall}^{0}$$

$$0.6\, Q_t = 0.5\, Q_t + \frac{3000}{1000 \times 60 \times 100\, N.ha} * \frac{3000}{1.14 * 4}$$

$$0.1\, Q_t = 0.33$$

$$Q_t = 3.3\ m^3/sec.$$

$$Q_g = 1.98\ m^3/sec.$$

$$Q_g \cdot t = d_g \cdot A_n$$

$$1.98 \times 24 \times 3600 \times t = \frac{90}{1000} * \frac{3000 * 2500}{1.14}$$

$$t = 3.46\ days.$$

$$Q_c \cdot t_c = Q_i \cdot t_i$$

$$Q_c * 7 = 1.98 * 3.46$$

$$Q_c = 0.98\ m^3/sec.$$

$$w.D = \frac{3000}{1.14 * 4 \times 0.98} = 671.321\ N.ha / G \cdot m^3/sec$$