

Question 1

$$P = 1500 \text{ mm}$$

$$E = 700 \text{ mm}$$

$$Q_{\text{out}} = 650 \text{ mm}$$

$$\left. \begin{matrix} Q_{\text{in}} \\ G \end{matrix} \right\} = 0$$

$$\begin{aligned} \Delta S &= P + \cancel{Q_{\text{in}}} - E - \cancel{G} - Q_{\text{out}} \\ &= 1500 - 700 - 650 \\ &= \underline{\underline{150 \text{ mm}}} \end{aligned}$$

Question 2

$$P = 1100 \text{ mm}$$

$$E = 450 \text{ mm}$$

$$Q_{\text{out}} = 500 \text{ mm}$$

$$G = 100 \text{ mm}$$

$$Q_{\text{in}} = 0$$

$$\begin{aligned} \Delta S &= P + \cancel{Q_{\text{in}}} - E - G - Q_{\text{out}} \\ \Delta S &= 1100 - 450 - 100 - 500 \\ &= \underline{\underline{50 \text{ mm}}} \end{aligned}$$

Question 3

$$P = 1300 \text{ mm}$$

$$Q_{\text{in}} = 200 \text{ mm}$$

$$E = 600 \text{ mm}$$

$$Q_{in} = 200 \text{ mm}$$

$$E = 600 \text{ mm}$$

$$Q_{out} = 550 \text{ mm}$$

$$G = 150 \text{ mm}$$

$$\begin{aligned}\Delta S &= P + Q_{in} - E - G - Q_{out} \\ &= 1300 + 200 - 600 - 150 - 550 \\ &= \underline{\underline{200 \text{ mm}}}\end{aligned}$$

Question 4

$$A = 120 \text{ hectares} = 1200000 \text{ m}^2$$

$$\text{Inflow Rate} = 2.5 \text{ m}^3/\text{s}$$

$$\text{Outflow Rate} = 2.0 \text{ m}^3/\text{s}$$

$$R_{ain} = 10 \text{ cm} = 0.1 \text{ m}$$

$$\Delta S = 900,000 \text{ m}^3$$

$$\begin{aligned}Q_{in} &= \text{Inflow Rate} \times \text{Time} \\ &= 2.5 \times (30 \times 24 \times 60 \times 60) \\ &= \underline{\underline{6.48 \times 10^6 \text{ m}^3}}\end{aligned}$$

$$\begin{aligned}Q_{out} &= \text{Outflow Rate} \times \text{Time} \\ &= 2.0 \times (30 \times 24 \times 60 \times 60) \\ &= \underline{\underline{5.18 \times 10^6 \text{ m}^3}}\end{aligned}$$

$$\begin{aligned}
 P &= \text{Rain} \times \text{Area} \\
 &= 0.1 \times 1200000 \\
 &= \underline{\underline{120000 \text{ m}^3}}
 \end{aligned}$$

$$\Delta S = P + Q_{in} - E - Q_{out} \quad \text{Rearrange in terms of } E$$

$$E = P + Q_{in} - Q_{out} - \Delta S$$

$$\begin{aligned}
 E &= 120000 + 6.48 \times 10^6 - 5.18 \times 10^6 - 900000 \\
 &= \underline{\underline{520000 \text{ m}^3}}
 \end{aligned}$$

$$\begin{aligned}
 \text{Evaporation Depth} &= \frac{E}{A} \\
 &= \frac{520000}{120000} = \underline{\underline{0.43 \text{ m}}}
 \end{aligned}$$

Question 5

$$A = 85 \text{ hectares} = 850000 \text{ m}^2$$

$$\text{Inflow Rate} = 1.8 \text{ m/s}$$

$$\text{Outflow Rate} = 1.4 \text{ m/s}$$

$$E = 500000 \text{ m}^3$$

$$\Delta S = 600000 \text{ m}^3$$

$$\begin{aligned}
 Q_{in} &= \text{Inflow} \times \text{Time} \\
 &= 1.8 \times (31 \times 24 \times 60 \times 60)
 \end{aligned}$$

$$= 1.8 \times (31 \times 24 \times 60 \times 60)$$

$$= \underline{\underline{4.82 \times 10^6 \text{ m}^3}}$$

$$Q_{\text{out}} = \text{Outflow} \times \text{Time}$$

$$= 1.4 \times (31 \times 24 \times 60 \times 60)$$

$$= \underline{\underline{3.75 \times 10^6 \text{ m}^3}}$$

$$\Delta S = P + Q_{\text{in}} - E - Q_{\text{out}}$$

$$P = \Delta S - Q_{\text{in}} + E + Q_{\text{out}}$$

$$= 600000 - 4.82 \times 10^6 + 500000 + 3.75 \times 10^6$$

$$= \underline{\underline{30000 \text{ m}^3}}$$

$$P_{\text{depth}} = \frac{P}{A}$$

$$= \frac{30000}{850000} = \underline{\underline{0.035 \text{ m}}}$$

Question 6

$$A = 150 \text{ hectares} = 1500000 \text{ m}^2$$

$$h_{\text{flow}} = 3.5 \text{ m}^3/\text{s}$$

$$\text{Outflow} = 2.4 \text{ m}^3/\text{s}$$

$$\text{Rain} = 10 \text{ cm} = 0.1 \text{ m}$$

$$E = 900000 \text{ m}^3$$

$$\Delta S = 15\,000\,000 \text{ m}^3$$

$$\begin{aligned} Q_{in} &= \text{Inflow} \times \text{Time} \\ &= 3.5 \times (31 \times 24 \times 60 \times 60) \\ &= \underline{\underline{9.37 \times 10^6 \text{ m}^3}} \end{aligned}$$

$$\begin{aligned} Q_{out} &= 2.4 \times (31 \times 24 \times 60 \times 60) \\ &= \underline{\underline{6.43 \times 10^6 \text{ m}^3}} \end{aligned}$$

$$\begin{aligned} P &= \text{Rain} \times \text{Area} \\ &= 0.10 \times 15\,000\,000 \\ &= \underline{\underline{1\,500\,000 \text{ m}^3}} \end{aligned}$$

$$\Delta S = P + Q_{in} - E - G - Q_{out}$$

$$\begin{aligned} G &= P + Q_{in} - E - Q_{out} - \Delta S \\ &= 1\,500\,000 + 9.37 \times 10^6 - 9\,000\,000 - 6.43 \times 10^6 - 15\,000\,000 \\ &= \underline{\underline{6\,900\,000 \text{ m}^3}} \end{aligned}$$