



ITU
CIVIL ENGINEERING FACULTY HYDRAULICS DIVISION
HYDROLOGY
Solutions –1 Introduction to Hydrology

- 1) Q_{in} = the mass of the water that enters the hydrologic system
 Q_{out} = the mass of the water that exits the hydrologic system
 $Q_{accumulation}$ = the mass of the stored water (ΔS)

$$Q_{inflow} = 0.7 \times 200 \times 10^6 + 1.2 \times 86400 \times 365 = 140 \times 10^6 + 37,84 \times 10^6 = 177,84 \times 10^6 \text{ m}^3/\text{year}$$

$$Q_{outflow} = 1,27 \times 86400 \times 365 = 40,05 \times 10^6 \text{ m}^3/\text{year}$$

$$Q_{accumulation} = 200 \times 10^6 \times 0,09 = 18 \times 10^6 \text{ m}^3/\text{year}$$

$$Q_{outflow} = Q_{inflow} - Q_{accumulation}$$

$$40,05 \times 10^6 + E = (177,84 - 18) \times 10^6$$

$$E = 159,84 \times 10^6 - 40,05 \times 10^6 = 119,79 \times 10^6 \text{ m}^3$$

$$\text{Evaporation height} = \frac{119,79 \times 10^6}{200 \times 10^6} = \mathbf{0,6m}$$

2)

$$Q_{inflow} = 6.7 \times 10^6 + 0.12 \times 1.1 \times 10^6 = 6.83 \times 10^6 \text{ m}^3$$

$$Q_{outflow} = 0,035 \times 1,1 \times 10^6 + 0,18 \times 10^6 = 0,22 \times 10^6 \text{ m}^3$$

$$Q_{accumulation} = 14 \times 10^6 - 8 \times 10^6 = 6 \times 10^6 \text{ m}^3$$

$$Q_{outflow} - Q_{inflow} = Q_{accumulation}$$

$$0,22 \times 10^6 + \text{Spillway} = (6,83 - 6) \times 10^6$$

$$\text{Spillway} = 0,83 \times 10^6 - 0,22 \times 10^6 = \mathbf{0,61 \times 10^6 \text{ m}^3}$$

3)

$$Q_{outflow} = 58 \times 10^6 + 9 \times 10^6 = 67 \times 10^6 \text{ m}^3$$

$$Q_{accumulation} = 359 \times 10^6 - 404 \times 10^6 = -45 \times 10^6 \text{ m}^3$$

$$Q_{outflow} - Q_{inflow} = Q_{accumulation}$$

$$Q_{inflow} = -45 \times 10^6 + 67 \times 10^6 = 22 \times 10^6 \text{ m}^3$$

$$\text{Discharge} = \frac{22 \times 10^6}{86400 \times 31} = \mathbf{8.21 \text{ m}^3/\text{s}}$$