Racionalna metoda

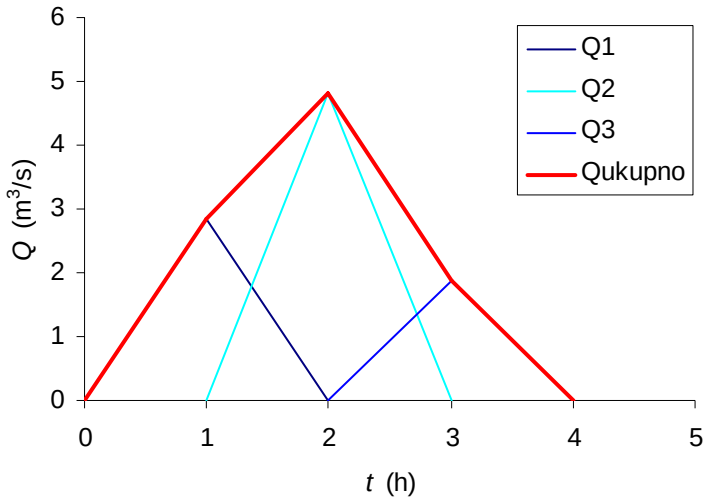
- Primer 1
  - sliv površine A = 8 km^2, vremena koncentracije t_c = 60 min, koeficijent oticaja η = 0.4
  - poznata zavisnost ITP za obližnju kišomernu stanicu
  - odrediti merodavni protok povratnog perioda T = 10 godina

t_k (min)	10	20	30	45	60	90	120	150	180
i_{10} (mm/min)	1.48	1.09	0.84	0.63	0.51	0.37	0.29	0.24	0.20
	$t_k < t_c$	$t_k < t_c$	$t_k < t_c$	$t_k < t_c$	$t_k = t_c$	$t_k > t_c$	$t_k > t_c$	$t_k > t_c$	$t_k > t_c$
Q_{max} (m^3/s)	13.2	19.4	22.4	25.2	27.2	19.7	15.5	12.8	10.7

Racionalna metoda

- Primer 2
  - sliv površine A = 8 km^2, vremena koncentracije t_c = 60 min, koeficijent oticaja η = 0.4
  - na obližnjoj kišomernoj stanici osmotrena kišna epizoda trajanja t_k = 180 min, sa časovnim visinama kiše od 3.2, 5.4 i 2.1 mm
  - odrediti hidrogram oticaja od osmotrene kišne epizode

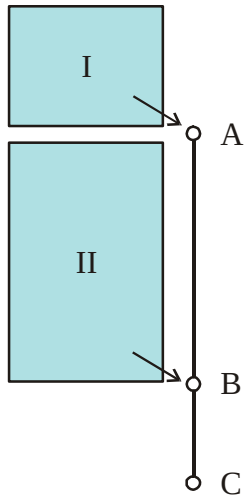
t (h)	0 – 1	1 – 2	2 – 3
ΔP (mm)	3.2	5.4	2.1
i (mm/h)	3.2	5.4	2.1
i_e (mm/h)	1.28	2.16	0.84
Q_{max} (m^3/s)	2.84	4.80	1.87



Racionalna metoda

- Primer 3
  - kolektor drenira dve slivne površine
  - poznata zavisnost ITP za obližnju kišomernu stanicu, koja se može prikazati u obliku:

$$i(t_k, T) = \frac{35.3 \cdot T^{0.175}}{t_k + 27} \quad [\text{mm/min}], \quad t_k\,[\text{min}]$$



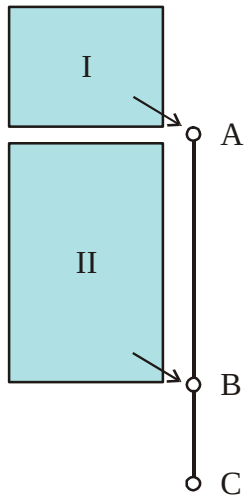
sliv	I	II
A (ha)	2	4
t_c (min)	10	15
η	0.7	0.6

kolektor	AB	BC
L (m)	150	100
J (%)	2.3	1.6
n	0.013	0.013

  - odrediti merodavne protoke povratnog perioda 5 godina za dimenzionisanje deonica AB i BC

Racionalna metoda

- Primer 3
  - deonica AB



sliv	I	II
A (ha)	2	4
t_c (min)	10	15
η	0.7	0.6

kolektor	AB	BC
L (m)	150	100
J (%)	2.3	1.6
n	0.013	0.013

$$i(10,5) = \frac{35.3 \cdot 5^{0.175}}{10+27} = 1.264 \text{ mm/min}$$

$$Q_{AB} = \eta_1 \cdot i(10,5) \cdot A_1 = 0.7 \cdot 1.264 \cdot \frac{10^{-3}}{60} \cdot 2 \cdot 10^4 = 295 \text{ l/s}$$

$$Q_{AB} = \frac{1}{n}\frac{D^2\pi}{4}\left(\frac{D}{4}\right)^{2/3}\sqrt{J_d} \quad \rightarrow \quad D = \left(\frac{nQ_{AB}\cdot 4^{5/3}}{\pi\sqrt{J_d}}\right)^{3/8} =$$

$$= \left(\frac{0.013 \cdot 0.295 \cdot 4^{5/3}}{\pi\sqrt{0.023}}\right)^{3/8} = 0.390 \text{ m}, \quad D_{AB} = 400 \text{ mm}$$

$$v_{AB} = \frac{Q_{AB}}{(D_{AB}^2\pi/4)} = \frac{0.295}{(0.4^2\pi/4)} = 2.35 \text{ m/s}$$

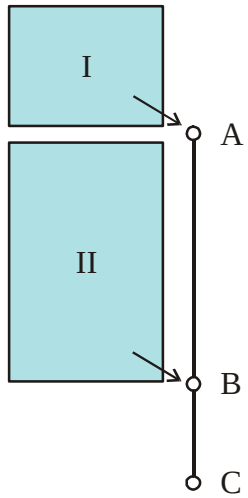
$$t_{AB} = \frac{L_{AB}}{v_{AB}} = \frac{150}{2.35} = 63.9 \text{ s} = 1.06 \text{ min}$$

$$t_{c,B} = \max\begin{Bmatrix} t_{c1} + t_{AB} \\ t_{c2} \end{Bmatrix} =$$

$$= \max\begin{Bmatrix} 10 + 1.06 \\ 15 \end{Bmatrix} = 15 \text{ min}$$

Racionalna metoda

- Primer 3
  - deonica BC



sliv	I	II
A (ha)	2	4
t_c (min)	10	15
η	0.7	0.6

kolektor	AB	BC
L (m)	150	100
J (%)	2.3	1.6
n	0.013	0.013

$$i(15,5) = \frac{35.3 \cdot 5^{0.175}}{15 + 27} = 1.114 \text{ mm/min}$$

$$Q_{BC} = i(15,5) \cdot (\eta_1 A_1 + \eta_2 A_2) =$$

$$= 1.114 \cdot \frac{10^{-3}}{60} \cdot (0.7 \cdot 2 + 0.6 \cdot 4) \cdot 10^4 = 706 \text{ l/s}$$

$$Q_{BC} = \frac{1}{n} \frac{D^2 \pi}{4} \left(\frac{D}{4} \right)^{2/3} \sqrt{J_d} \quad \rightarrow \quad D = \left(\frac{0.013 \cdot 0.706 \cdot 4^{5/3}}{\pi \sqrt{0.016}} \right)^{3/8} = 0.579 \text{ m}, \quad D_{BC} = 600 \text{ mm}$$

$$v_{BC} = \frac{Q_{BC}}{(D_{BC}^2 \pi / 4)} = \frac{0.706}{(0.6^2 \pi / 4)} = 2.50 \text{ m/s}$$

$$t_{BC} = \frac{L_{BC}}{v_{BC}} = \frac{100}{2.50} = 40 \text{ s} = 0.67 \text{ min}$$

$$\rightarrow \quad t_{c,C} = t_{c,B} + t_{BC} = 15 + 0.67 = 15.67 \text{ min}$$