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Basic Equations of Flood Routing Formulas

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List of 16 Basic Equations of Flood Routing Formulas

Basic Equations of Flood Routing

1) Average Inflow Denoting at Beginning and End of Time Interval

$$\text{fx } I_{\text{avg}} = \frac{I_1 + I_2}{2}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 60\text{m}^3/\text{s} = \frac{55\text{m}^3/\text{s} + 65\text{m}^3/\text{s}}{2}$$

2) Average Inflow given Change in Storage

$$\text{fx } I_{\text{avg}} = \frac{\Delta S_v + Q_{\text{avg}} \cdot \Delta t}{\Delta t}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 60\text{m}^3/\text{s} = \frac{20 + 56\text{m}^3/\text{s} \cdot 5\text{s}}{5\text{s}}$$

3) Average Outflow Denoting Beginning and End of Time Interval

$$\text{fx } Q_{\text{avg}} = \frac{Q_1 + Q_2}{2}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 56\text{m}^3/\text{s} = \frac{48\text{m}^3/\text{s} + 64\text{m}^3/\text{s}}{2}$$



4) Average Outflow in Time given Change in Storage

$$\text{fx } Q_{\text{avg}} = \frac{I_{\text{avg}} \cdot \Delta t - \Delta S_v}{\Delta t}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$\text{ex } 56 \text{m}^3/\text{s} = \frac{60 \text{m}^3/\text{s} \cdot 5\text{s} - 20}{5\text{s}}$$

5) Change in Storage Denoting Beginning and End of Time Interval

$$\text{fx } \Delta S_v = S_2 - S_1$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$\text{ex } 20 = 35 - 15$$

6) Change in Storage Denoting Beginning and End of Time Interval concerning Inflow and Outflow

$$\text{fx } \Delta S_v = \left(\frac{I_1 + I_2}{2} \right) \cdot \Delta t - \left(\frac{Q_1 + Q_2}{2} \right) \cdot \Delta t$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$\text{ex } 20 = \left(\frac{55 \text{m}^3/\text{s} + 65 \text{m}^3/\text{s}}{2} \right) \cdot 5\text{s} - \left(\frac{48 \text{m}^3/\text{s} + 64 \text{m}^3/\text{s}}{2} \right) \cdot 5\text{s}$$

7) Inflow at Beginning of Time Interval given Average Inflow

$$\text{fx } I_1 = 2 \cdot I_{\text{avg}} - I_2$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$\text{ex } 55 \text{m}^3/\text{s} = 2 \cdot 60 \text{m}^3/\text{s} - 65 \text{m}^3/\text{s}$$



8) Inflow at End of Time Interval given Average Inflow 

$$\text{fx } I_2 = 2 \cdot I_{\text{avg}} - I_1$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$\text{ex } 65\text{m}^3/\text{s} = 2 \cdot 60\text{m}^3/\text{s} - 55\text{m}^3/\text{s}$$

9) Inflow Rate given Rate of Change of Storage 

$$\text{fx } I = R_{\text{ds}/\text{dt}} + Q$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$\text{ex } 28\text{m}^3/\text{s} = 3.0 + 25\text{m}^3/\text{s}$$

10) Outflow at Beginning of Time Interval given Average Inflow 

$$\text{fx } Q_1 = 2 \cdot Q_{\text{avg}} - Q_2$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$\text{ex } 48\text{m}^3/\text{s} = 2 \cdot 56\text{m}^3/\text{s} - 64\text{m}^3/\text{s}$$

11) Outflow at End of Time Interval given Average Inflow 

$$\text{fx } Q_2 = 2 \cdot Q_{\text{avg}} - Q_1$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$\text{ex } 64\text{m}^3/\text{s} = 2 \cdot 56\text{m}^3/\text{s} - 48\text{m}^3/\text{s}$$

12) Outflow Rate given Rate of Change of Storage 

$$\text{fx } Q = I - R_{\text{ds}/\text{dt}}$$

[Open Calculator !\[\]\(40770d9ed6ed4f1222ebf89a1396e8b2_img.jpg\)](#)

$$\text{ex } 25\text{m}^3/\text{s} = 28\text{m}^3/\text{s} - 3.0$$



13) Rate of Change of Storage 

$$fx \quad R_{ds}/dt = I - Q$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$ex \quad 3 = 28m^3/s - 25m^3/s$$

14) Storage at Beginning of Time Interval 

$$fx \quad S_1 = S_2 - \Delta S v$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$ex \quad 15 = 35 - 20$$

15) Storage at End of Time Interval 

$$fx \quad S_2 = \Delta S v + S_1$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$ex \quad 35 = 20 + 15$$

16) Storage at End of Time Interval of Reservoir 

fx

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$S_2 = S_1 + \left(\frac{I_1 + I_2}{2} \right) \cdot \Delta t - \left(\frac{Q_1 + Q_2}{2} \right) \cdot \Delta t$$

$$ex \quad 35 = 15 + \left(\frac{55m^3/s + 65m^3/s}{2} \right) \cdot 5s - \left(\frac{48m^3/s + 64m^3/s}{2} \right) \cdot 5s$$





Variables Used

- **I** Inflow Rate (Cubic Meter per Second)
- **I₁** Inflow at the Beginning of Time Interval (Cubic Meter per Second)
- **I₂** Inflow at the End of Time Interval (Cubic Meter per Second)
- **I_{avg}** Average Inflow (Cubic Meter per Second)
- **Q** Outflow Rate (Cubic Meter per Second)
- **Q₁** Outflow at the Beginning of Time Interval (Cubic Meter per Second)
- **Q₂** Outflow at the End of Time Interval (Cubic Meter per Second)
- **Q_{avg}** Average Outflow (Cubic Meter per Second)
- **R_{ds/dt}** Rate of Change of Storage
- **S₁** Storage at the Beginning of Time Interval
- **S₂** Storage at the End of Time Interval
- **ΔS_v** Change in Storage Volumes
- **Δt** Time Interval (Second)






Constants, Functions, Measurements used

- **Measurement: Time** in Second (s)
Time Unit Conversion 
- **Measurement: Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
Volumetric Flow Rate Unit Conversion 



Check other formula lists

- **Basic Equations of Flood Routing Formulas** 
- **Clark's Method and Nash Model for IUH (Instantaneous Unit Hydrograph) Formulas** 
- **Hydrologic Routing Formulas** 

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