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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

Open Calculator

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

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

Open Calculator

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

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

Open Calculator

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

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

Open Calculator

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

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

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

Open Calculator

fx $$\Delta Sv = S_2 - S_1$$

ex $$20 = 35 - 15$$

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

Open Calculator

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

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

7) Inflow at Beginning of Time Interval given Average Inflow

Open Calculator

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

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

8) Inflow at End of Time Interval given Average Inflow

Open Calculator

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

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

9) Inflow Rate given Rate of Change of Storage

Open Calculator

$$I = R_{ds/dt} + Q$$

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

10) Outflow at Beginning of Time Interval given Average Inflow

Open Calculator

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

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

11) Outflow at End of Time Interval given Average Inflow

Open Calculator

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

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

12) Outflow Rate given Rate of Change of Storage

Open Calculator

$$Q = I - R_{ds/dt}$$

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

13) Rate of Change of Storage

Open Calculator

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

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

14) Storage at Beginning of Time Interval

Open Calculator

fx $$S_1 = S_2 - \Delta Sv$$

ex $$15 = 35 - 20$$

15) Storage at End of Time Interval

Open Calculator

fx $$S_2 = \Delta Sv + S_1$$

ex $$35 = 20 + 15$$

16) Storage at End of Time Interval of Reservoir

Open Calculator

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

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

Variables Used

- **I** Inflow Rate *(Cubic Meter per Second)*
- I_1 Inflow at the Beginning of Time Interval *(Cubic Meter per Second)*
- I_2 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)*
- Q_1 Outflow at the Beginning of Time Interval *(Cubic Meter per Second)*
- Q_2 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
- S_1 Storage at the Beginning of Time Interval
- S_2 Storage at the End of Time Interval
- **ΔSv** 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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