Important Basic Equations of Flood Routing Formulas PDF

Formulas
Examples
with Units

List of 16
Important Basic Equations of Flood Routing Formulas

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

Evaluate Formula

Formula

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

Example with Units

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

2) Average Inflow given Change in Storage Formula

Evaluate Formula

Formula

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

Example with Units

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

3) Average Outflow Denoting Beginning and End of Time Interval Formula

Evaluate Formula

Formula

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

Example with Units

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

4) Average Outflow in Time given Change in Storage Formula

Evaluate Formula

Formula

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

Example with Units

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

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

Evaluate Formula

Formula

$$\Delta Sv = S_2 - S_1$$

Example

$$20 = 35 - 15$$

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

Evaluate Formula

Formula

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

Example with Units

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

7) Inflow at Beginning of Time Interval given Average Inflow Formula

Evaluate Formula

Formula

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

Example with Units

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

8) Inflow at End of Time Interval given Average Inflow Formula

Evaluate Formula

Formula

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

Example with Units

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

9) Inflow Rate given Rate of Change of Storage Formula

Evaluate Formula

Formula

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

Example with Units

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

10) Outflow at Beginning of Time Interval given Average Inflow Formula

Evaluate Formula

Formula

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

Example with Units

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

11) Outflow at End of Time Interval given Average Inflow Formula

Evaluate Formula

Formula

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

Example with Units

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

12) Outflow Rate given Rate of Change of Storage Formula

Evaluate Formula

Formula

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

Example with Units

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

13) Rate of Change of Storage Formula

Evaluate Formula

Formula

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

Example with Units

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

14) Storage at Beginning of Time Interval Formula

Evaluate Formula

Formula

$$S_1 = S_2 - \Delta Sv$$

Example

$$15 = 35 - 20$$

15) Storage at End of Time Interval Formula

Evaluate Formula

Formula

$$S_2 = \Delta Sv + S_1$$

Example

$$35 = 20 + 15$$

16) Storage at End of Time Interval of Reservoir Formula

Evaluate Formula

Formula

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

Example with Units

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

Variables used in list of Basic Equations of Flood Routing Formulas above

- **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 in list of Basic Equations of Flood Routing Formulas above

- 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

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