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Rational Method to Estimate the Flood Peak Formulas

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List of 20 Rational Method to Estimate the Flood Peak Formulas

Rational Method to Estimate the Flood Peak

1) Coefficient of Runoff when Peak Discharge for Field Application is Considered

Open Calculator

fx $$C_r = \frac{Q_p}{\left(\frac{1}{3.6}\right) \cdot i_{tcp} \cdot A_D}$$

ex $$0.5 = \frac{4\text{m}^3/\text{s}}{\left(\frac{1}{3.6}\right) \cdot 5.76\text{mm/h} \cdot 18\text{km}^2}$$

2) Coefficient of Runoff when Peak Value is Considered

Open Calculator

fx $$C_r = \frac{Q_p}{A_D \cdot i}$$

ex $$0.5 = \frac{4\text{m}^3/\text{s}}{18\text{km}^2 \cdot 1.6\text{mm/h}}$$

3) Drainage Area given Peak Discharge for Field Application

Open Calculator

fx $$A_D = \frac{Q_p}{\left(\frac{1}{3.6}\right) \cdot i_{tcp} \cdot C_r}$$

ex $$18\text{km}^2 = \frac{4\text{m}^3/\text{s}}{\left(\frac{1}{3.6}\right) \cdot 5.76\text{mm/h} \cdot 0.5}$$

4) Drainage Area when Peak Discharge for Field Application is Considered

Open Calculator

fx $$A_D = \frac{Q_p}{\left(\frac{1}{3.6}\right) \cdot i_{tcp} \cdot C_r}$$

ex $$18\text{km}^2 = \frac{4\text{m}^3/\text{s}}{\left(\frac{1}{3.6}\right) \cdot 5.76\text{mm/h} \cdot 0.5}$$

5) Drainage Area when Peak Discharge is Considered

Open Calculator

fx $$A_D = \frac{Q_p}{i \cdot C_r}$$

ex $$18\text{km}^2 = \frac{4\text{m}^3/\text{s}}{1.6\text{mm/h} \cdot 0.5}$$

6) Intensity of Precipitation when Peak Discharge for Field Application is Considered

Open Calculator

fx $$i_{tcp} = \frac{Q_p}{\left(\frac{1}{3.6}\right) \cdot C_r \cdot A_D}$$

ex $$5.76\text{mm/h} = \frac{4\text{m}^3/\text{s}}{\left(\frac{1}{3.6}\right) \cdot 0.5 \cdot 18\text{km}^2}$$

7) Intensity of Rainfall when Peak Discharge is Considered

Open Calculator

fx $$i = \frac{Q_p}{C_r \cdot A_D}$$

ex $$1.6\text{mm/h} = \frac{4\text{m}^3/\text{s}}{0.5 \cdot 18\text{km}^2}$$

8) Peak Discharge Equation based on Field Application

Open Calculator

fx $$Q_p = \left(\frac{1}{3.6}\right) \cdot C_r \cdot i_{tcp} \cdot A_D$$

ex $$4\text{m}^3/\text{s} = \left(\frac{1}{3.6}\right) \cdot 0.5 \cdot 5.76\text{mm/h} \cdot 18\text{km}^2$$

9) Peak Discharge for Field Application

Open Calculator

fx $$Q_p = \left(\frac{1}{3.6}\right) \cdot C_r \cdot i_{tcp} \cdot A_D$$

ex $$4\text{m}^3/\text{s} = \left(\frac{1}{3.6}\right) \cdot 0.5 \cdot 5.76\text{mm/h} \cdot 18\text{km}^2$$

10) Peak value of runoff

Open Calculator

fx $$Q_p = C_r \cdot A_D \cdot i$$

ex $$4\text{m}^3/\text{s} = 0.5 \cdot 18\text{km}^2 \cdot 1.6\text{mm/h}$$

11) Value of Peak Discharge

Open Calculator

fx $$Q_p = C_r \cdot A_D \cdot i$$

ex $$4\text{m}^3/\text{s} = 0.5 \cdot 18\text{km}^2 \cdot 1.6\text{mm/h}$$

Kirpich Equation(1940)

12) Kirpich Adjustment Factor

Open Calculator

fx $$K_1 = \sqrt{\frac{L^3}{\Delta H}}$$

ex $$54772.26 = \sqrt{\frac{(3\text{km})^3}{9\text{m}}}$$

13) Kirpich Equation

Open Calculator

fx $$t_c = 0.01947 \cdot L^{0.77} \cdot S^{-0.385}$$

ex $$86.70769\text{s} = 0.01947 \cdot (3\text{km})^{0.77} \cdot (0.003)^{-0.385}$$

14) Kirpich equation for Time of Concentration

Open Calculator

fx $$t_c = 0.01947 \cdot \left(L^{0.77}\right) \cdot S^{-0.385}$$

ex $$86.70769\text{s} = 0.01947 \cdot \left((3\text{km})^{0.77}\right) \cdot (0.003)^{-0.385}$$

15) Maximum Length of Travel of Water

Open Calculator

fx $$L = \left(\frac{t_c}{0.01947 \cdot S^{-0.385}}\right)^{\frac{1}{0.77}}$$

ex $$3.013141\text{km} = \left(\frac{87\text{s}}{0.01947 \cdot (0.003)^{-0.385}}\right)^{\frac{1}{0.77}}$$

16) Slope of Catchment about given Time of Concentration

Open Calculator

fx $$S = \left(\frac{t_c}{0.01947 \cdot L^{0.77}}\right)^{-\frac{1}{0.385}}$$

ex $$0.002974 = \left(\frac{87\text{s}}{0.01947 \cdot (3\text{km})^{0.77}}\right)^{-\frac{1}{0.385}}$$

17) Time of Concentration from Kirpich Adjustment Factor

Open Calculator

fx $$t_c = 0.01947 \cdot K_1^{0.77}$$

ex $$86.7077\text{s} = 0.01947 \cdot (54772.26)^{0.77}$$

US Practice

18) Basin Lag for Foot Hill Drainage Area

Open Calculator

fx $$t_p = 1.03 \cdot \left(L_{basin} \cdot \frac{L_{ca}}{\sqrt{S_B}} \right)^{0.38}$$

ex $$6.093265\text{h} = 1.03 \cdot \left(9.4\text{km} \cdot \frac{12.0\text{km}}{\sqrt{1.1}} \right)^{0.38}$$

19) Basin Lag for Mountainous Drainage Areas

Open Calculator

fx $$t_p = 1.715 \cdot \left(L_{basin} \cdot \frac{L_{ca}}{\sqrt{S_B}} \right)^{0.38}$$

ex $$10.14558\text{h} = 1.715 \cdot \left(9.4\text{km} \cdot \frac{12.0\text{km}}{\sqrt{1.1}} \right)^{0.38}$$

20) Basin Lag for Valley Drainage Areas

Open Calculator

fx $$t_p = 0.5 \cdot \left(L_{basin} \cdot \frac{L_{ca}}{\sqrt{S_B}} \right)^{0.38}$$

ex $$2.957896\text{h} = 0.5 \cdot \left(9.4\text{km} \cdot \frac{12.0\text{km}}{\sqrt{1.1}} \right)^{0.38}$$

Variables Used

- A_D Drainage Area *(Square Kilometer)*
- C_r Runoff Coefficient
- i Intensity of Rainfall *(Millimeter per Hour)*
- i_{tcp} Mean Intensity of Precipitation *(Millimeter per Hour)*
- K_1 Kirpich Adjustment Factor
- L Maximum Length of Travel of Water *(Kilometer)*
- L_{basin} Basin Length *(Kilometer)*
- L_{ca} Distance along Main Water Course *(Kilometer)*
- Q_p Peak Discharge *(Cubic Meter per Second)*
- S Slope of Catchment
- S_B Basin Slope
- t_c Time of Concentration *(Second)*
- t_p Basin Lag *(Hour)*
- ΔH Difference in Elevation *(Meter)*

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Kilometer (km), Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s), Hour (h)
  Time Unit Conversion
- Measurement: **Area** in Square Kilometer (km²)
  Area Unit Conversion
- Measurement: **Speed** in Millimeter per Hour (mm/h)
  Speed Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion

Check other formula lists

- **Empirical Formulae for Flood-Peak Area Relationships Formulas**
- **Gumbel's Method for Prediction of Flood's Peak Formulas**
- **Rational Method to Estimate the Flood Peak Formulas**
- **Risk, Reliability and Log-Pearson Distribution Formulas**

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