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Gumbel's Method for Prediction of Flood's Peak Formulas

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List of 22 Gumbel's Method for Prediction of Flood's Peak Formulas

Gumbel's Method for Prediction of Flood's Peak

1) Frequency Factor as applicable to Infinite Sample Size

Open Calculator

fx $$K_z = \frac{y_T - 0.577}{1.2825}$$

ex $$2.731384 = \frac{4.08 - 0.577}{1.2825}$$

2) Frequency Factor given Variate 'x' concerning Return Period

Open Calculator

fx $$K_z = \frac{x_T - x_m}{\sigma}$$

ex $$7.0816 = \frac{9.43 - 0.578}{1.25}$$

3) Frequency Factor in Gumbel's Equation for Practical Use

Open Calculator

fx $$K_z = \frac{y_T - y_n}{S_n}$$

ex $$7.006 = \frac{4.08 - 0.577}{0.50}$$

4) General Equation of Hydrologic Frequency Analysis

Open Calculator

fx $x_T = x_m + K_z \cdot \sigma$

ex $9.328 = 0.578 + 7 \cdot 1.25$

5) Gumbel's Variate 'x' with Recurrence Interval for Practical Use

Open Calculator

fx $x_T = x_m + K_z \cdot \sigma_{n-1}$

ex $9.538 = 0.578 + 7 \cdot 1.28$

6) Mean of Variate in Flood Frequency Studies

Open Calculator

fx $x_m = x_T - K_z \cdot \sigma$

ex $0.68 = 9.43 - 7 \cdot 1.25$

7) Mean Variate given Variate 'x' with Recurrence Interval for Practical Use

Open Calculator

fx $x_m = x_T - (K_z \cdot \sigma_{n-1})$

ex $0.47 = 9.43 - (7 \cdot 1.28)$

8) Reduced Mean when Frequency Factor and Standard Deviation are Considered

Open Calculator

fx $y_n = y_T - (K_z \cdot S_n)$

ex $0.58 = 4.08 - (7 \cdot 0.50)$

9) Reduced Standard Deviation when Variate and Reduced Mean is Considered

Open Calculator

fx $$S_n = \frac{y_T - y_n}{K_z}$$

ex $$0.500429 = \frac{4.08 - 0.577}{7}$$

10) Reduced Variate concerning Return Period

Open Calculator

fx $$y_T = -\left(\ln\left(\ln\left(\frac{T_r}{T_r - 1}\right)\right)\right)$$

ex $$5.007293 = -\left(\ln\left(\ln\left(\frac{150}{150 - 1}\right)\right)\right)$$

11) Reduced Variate for Return Period when Frequency Factor is Considered

Open Calculator

fx $$y_{tf} = (K_z \cdot 1.2825) + 0.577$$

ex $$9.5545 = (7 \cdot 1.2825) + 0.577$$

12) Reduced Variate when Frequency Factor and Standard Deviation is Considered

Open Calculator

fx $$y_{tf} = K_z \cdot \sigma_{n\text{-}1} + y_n$$

ex $$9.537 = 7 \cdot 1.28 + 0.577$$

13) Reduced Variate 'Y' for given Return Period

Open Calculator

$$y_T = -\left(0.834 + 2.303 \cdot \log 10\left(\log 10\left(\frac{T_r}{T_r - 1}\right)\right)\right)$$

ex $$5.008378 = -\left(0.834 + 2.303 \cdot \log 10\left(\log 10\left(\frac{150}{150 - 1}\right)\right)\right)$$

14) Reduced Variate 'Y' in Gumbel's Method

Open Calculator

$$y = \left(\frac{1.285 \cdot (x_T - x_m)}{\sigma}\right) + 0.577$$

ex $$9.676856 = \left(\frac{1.285 \cdot (9.43 - 0.578)}{1.25}\right) + 0.577$$

Confidence Limits

15) Confidence Interval of Variate

Open Calculator

$$x_1 = x_T + f_c \cdot S_e$$

ex $$12.43 = 9.43 + 15 \cdot 0.2$$

16) Confidence Interval of Variate Bounded by X2

Open Calculator

$$x_2 = x_T + f_c \cdot S_e$$

ex $$12.43 = 9.43 + 15 \cdot 0.2$$

17) Equation for Confidence Interval of Variate

Open Calculator

fx $x_1 = x_T - f_c \cdot S_e$

ex $6.43 = 9.43 - 15 \cdot 0.2$

18) Equation for Confidence Interval of Variate Bounded by x2

Open Calculator

fx $x_2 = x_T - f_c \cdot S_e$

ex $6.43 = 9.43 - 15 \cdot 0.2$

19) Equation for Variate 'b' using Frequency Factor

Open Calculator

fx $b = \sqrt{1 + (1.3 \cdot K_z) + (1.1 \cdot K_z^2)}$

ex $8 = \sqrt{1 + (1.3 \cdot 7) + (1.1 \cdot (7)^2)}$

20) Probable Error

Open Calculator

fx $S_e = b \cdot \left(\frac{\sigma_{n-1}}{\sqrt{N}} \right)$

ex $0.200017 = 8 \cdot \left(\frac{1.28}{\sqrt{2621}} \right)$

21) Sample Size when Probable Error is Considered

Open Calculator

fx $$N = \left(\frac{b \cdot \sigma_{n-1}}{S_e} \right)^2$$

ex $$2621.44 = \left(\frac{8 \cdot 1.28}{0.2} \right)^2$$

22) Variate 'b' given Probable Error

Open Calculator

fx $$b = S_e \cdot \frac{\sqrt{N}}{\sigma_{n-1}}$$

ex $$7.999329 = 0.2 \cdot \frac{\sqrt{2621}}{1.28}$$

Variables Used

- **b** Variable 'b' in Probable Error
- **f_c** Function of Confidence Probability
- **K_z** Frequency Factor
- **N** Sample Size
- **S_e** Probable Error
- **S_n** Reduced Standard Deviation
- **T_r** Return Period
- **x_1** Value of 'x1' Bounded to Variate 'Xt'
- **x_2** Value of 'x2' Bounded to Variate 'Xt'
- **x_m** Mean of the Variate X
- **x_T** Variate 'X' with a Recurrence Interval
- **y** Reduced Variate 'Y'
- **y_n** Reduced Mean
- **y_T** Reduced Variate 'Y' for Return Period
- **y_{tf}** Reduced Variate 'Y' with Respect to Frequency
- **σ** Standard Deviation of the Z Variate Sample
- **σ_{n-1}** Standard Deviation of the Sample of Size N

Constants, Functions, Measurements used

- Function: **ln**, ln(Number)
  Natural logarithm function (base e)
- Function: **log10**, log10(Number)
  Common logarithm function (base 10)
- Function: **sqrt**, sqrt(Number)
  Square root function

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**

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