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

Formulas
Examples
with Units

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

1) Frequency Factor as applicable to Infinite Sample Size Formula

Evaluate Formula

Formula

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

Example

$$2.7314 = \frac{4.08 - 0.577}{1.2825}$$

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

Evaluate Formula

Formula

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

Example

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

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

Evaluate Formula

Formula

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

Example

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

4) General Equation of Hydrologic Frequency Analysis Formula

Evaluate Formula

Formula

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

Example

$$9.328 = 0.578 + 7 \cdot 1.25$$

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

Evaluate Formula

Formula

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

Example

$$9.538 = 0.578 + 7 \cdot 1.28$$

6) Mean of Variate in Flood Frequency Studies Formula

Evaluate Formula

Formula

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

Example

$$0.68 = 9.43 - 7 \cdot 1.25$$

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

Evaluate Formula

Formula

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

Example

$$0.47 = 9.43 - \left(7 \cdot 1.28 \right)$$

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

Evaluate Formula

Formula

$$y_n = y_T - \left(K_z \cdot S_n \right)$$

Example

$$0.58 = 4.08 - \left(7 \cdot 0.50 \right)$$

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

Evaluate Formula

Formula

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

Example

$$0.5004 = \frac{4.08 - 0.577}{7}$$

10) Reduced Variate concerning Return Period Formula

Evaluate Formula

Formula

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

Example

$$5.0073 = -\left(\ln\left(\ln\left(\frac{150}{150 - 1} \right) \right) \right)$$

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

Evaluate Formula

Formula

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

Example

$$9.5545 = \left(7 \cdot 1.2825 \right) + 0.577$$

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

Evaluate Formula

Formula

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

Example

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

13) Reduced Variate 'Y' for given Return Period Formula

Evaluate Formula

Formula

$$y_T = -\left(0.834 + 2.303 \cdot \log10\left(\log10\left(\frac{T_r}{T_r - 1} \right) \right) \right)$$

Example

$$5.0084 = -\left(0.834 + 2.303 \cdot \log10\left(\log10\left(\frac{150}{150 - 1} \right) \right) \right)$$

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

Evaluate Formula

Formula

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

Example

$$9.6769 = \left(\frac{1.285 \cdot \left(9.43 - 0.578 \right)}{1.25} \right) + 0.577$$

15) Confidence Limits Formulas

15.1) Confidence Interval of Variate Formula

Evaluate Formula

Formula

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

Example

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

15.2) Confidence Interval of Variate Bounded by X2 Formula

Evaluate Formula

Formula

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

Example

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

15.3) Equation for Confidence Interval of Variate Formula

Evaluate Formula

Formula

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

Example

$$6.43 = 9.43 - 15 \cdot 0.2$$

15.4) Equation for Confidence Interval of Variate Bounded by x2 Formula

Evaluate Formula

Formula

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

Example

$$6.43 = 9.43 - 15 \cdot 0.2$$

15.5) Equation for Variate 'b' using Frequency Factor Formula

Evaluate Formula

Formula

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

Example

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

15.6) Probable Error Formula

Evaluate Formula

Formula

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

Example

$$0.2 = 8 \cdot \left(\frac{1.28}{\sqrt{2621}} \right)$$

15.7) Sample Size when Probable Error is Considered Formula

Evaluate Formula

Formula

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

Example

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

15.8) Variate 'b' given Probable Error Formula

Evaluate Formula

Formula

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

Example

$$7.9993 = 0.2 \cdot \frac{\sqrt{2621}}{1.28}$$

Variables used in list of Gumbel's Method for Prediction of Flood's Peak Formulas above

- **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 in list of Gumbel's Method for Prediction of Flood's Peak Formulas above

- Functions: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Functions: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Functions: **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.

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