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Wave Period Distribution and Wave Spectrum Formulas

Calculators!

Examples!

Conversions!

List of 10 Wave Period Distribution and Wave Spectrum Formulas

Wave Period Distribution and Wave Spectrum

1) Equilibrium Form of PM Spectrum for Fully-Developed Seas

fx Open Calculator

$$E_f = \left(\frac{0.0081 \cdot [g]^2}{(2 \cdot \pi)^4 \cdot f^5} \right) \cdot \exp\left(-0.24 \cdot \left(\frac{2 \cdot \pi \cdot U \cdot f}{[g]} \right)^{-4} \right)$$

ex

$$1.5E\hat{}\text{-}8 = \left(\frac{0.0081 \cdot [g]^2}{(2 \cdot \pi)^4 \cdot (8\text{kHz})^5} \right) \cdot \exp\left(-0.24 \cdot \left(\frac{2 \cdot \pi \cdot 4\text{m/s} \cdot 8\text{kHz}}{[g]} \right)^{-4} \right)$$

2) Maximum Wave Period

fx Open Calculator

$$T_{max} = \Delta \cdot T'$$

ex

$$85.8\text{s} = 33 \cdot 2.6\text{s}$$

3) Mean Crest Period

fx Open Calculator

$$T_c = 2 \cdot \pi \cdot \left(\frac{m_2}{m_4} \right)$$

ex

$$14.90925\text{s} = 2 \cdot \pi \cdot \left(\frac{1.4}{0.59} \right)$$

4) Mean Zero-upcrossing Period

Open Calculator

fx $$T'_Z = 2 \cdot \pi \cdot \sqrt{\frac{m_0}{m_2}}$$

ex $$86.44478\text{s} = 2 \cdot \pi \cdot \sqrt{\frac{265}{1.4}}$$

5) Most Probable Maximum Wave Period

Open Calculator

fx $$T_{max} = 2 \cdot \frac{\sqrt{1 + v^2}}{1} + \sqrt{1 + \left(16 \cdot \frac{v^2}{\pi} \cdot H^2\right)}$$

ex $$87.80989\text{s} = 2 \cdot \frac{\sqrt{1 + (10)^2}}{1} + \sqrt{1 + \left(16 \cdot \frac{(10)^2}{\pi} \cdot (3\text{m})^2\right)}$$

6) Probability Density of Wave Period

Open Calculator

fx $$p = 2.7 \cdot \left(\frac{P^3}{T'}\right) \cdot \exp\left(-0.675 \cdot \left(\frac{P}{T'}\right)^4\right)$$

ex $$1.116046 = 2.7 \cdot \left(\frac{(1.03)^3}{2.6\text{s}}\right) \cdot \exp\left(-0.675 \cdot \left(\frac{1.03}{2.6\text{s}}\right)^4\right)$$

7) Relative Phase given coefficients

Open Calculator

fx $$\varepsilon_{v} = a\tanh\left(\frac{b_{n}}{a_{n}}\right)$$

ex $$0.168236 = a\tanh\left(\frac{0.1}{0.6}\right)$$

8) Spectral Bandwidth

Open Calculator

fx $$V = \sqrt{1 - \left(\frac{m_{2}^{2}}{m_{0} \cdot m_{4}}\right)}$$

ex $$0.993712\text{m} = \sqrt{1 - \left(\frac{(1.4)^{2}}{265 \cdot 0.59}\right)}$$

9) Spectral Width

Open Calculator

fx $$v = \sqrt{\left(m_{0} \cdot \frac{m_{2}}{m_{1}^{2}}\right) - 1}$$

ex $$9.578622 = \sqrt{\left(265 \cdot \frac{1.4}{(2)^{2}}\right) - 1}$$

10) Wave Component Amplitude

Open Calculator

fx $a = \sqrt{0.5 \cdot \sqrt{a_n^2 + b_n^2}}$

ex $0.551487\text{m} = \sqrt{0.5 \cdot \sqrt{(0.6)^2 + (0.1)^2}}$

Variables Used

- **a** Wave Amplitude *(Meter)*
- **a_n** Coefficient of Wave Component Amplitude
- **b_n** Coefficient of Wave Component Amplitude bn
- **E_f** Frequency Energy Spectrum
- **f** Wave Frequency *(Kilohertz)*
- **H** Wave Height *(Meter)*
- **m_0** Zero-th Moment of Wave Spectrum
- **m_1** Moment of Wave Spectrum 1
- **m_2** Moment of Wave Spectrum 2
- **m_4** Moment of Wave Spectrum 4
- **p** Probability
- **P** Wave Period
- **T'** Mean Wave Period *(Second)*
- **T_c** Wave Crest Period *(Second)*
- **T_{max}** Maximum Wave Period *(Second)*
- **T'_Z** Mean Zero-upcrossing Period *(Second)*
- **U** Wind Speed *(Meter per Second)*
- **v** Spectral Width
- **V** Spectral Bandwidth *(Meter)*
- **Δ** Coefficient Eckman
- **ε_v** Relative Phase

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Function: **atanh**, atanh(Number)
  The inverse hyperbolic tangent function returns the value whose hyperbolic tangent is a number.
- Function: **exp**, exp(Number)
  n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- 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.
- Function: **tanh**, tanh(Number)
  The hyperbolic tangent function (tanh) is a function that is defined as the ratio of the hyperbolic sine function (sinh) to the hyperbolic cosine function (cosh).
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Frequency** in Kilohertz (kHz)
  Frequency Unit Conversion

Check other formula lists

- Cnoidal Wave Theory Formulas
- Horizontal and Vertical Semi-Axis of Ellipse Formulas
- Wave Parameters Formulas
- Wave Period Formulas
- Wave Period Distribution and Wave Spectrum Formulas
- Zero-Crossing Method Formulas

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