Important RLC Circuit Formulas PDF

Formulas
Examples
with Units

List of 13
Important RLC Circuit Formulas

1) Capacitance for Parallel RLC Circuit using Q Factor Formula

Evaluate Formula

Formula

$$C = \frac{L \cdot Q_{||}^2}{R^2}$$

Example with Units

$$349.3578\,\mu F = \frac{0.79\,mH \cdot 39.9^2}{60\,\Omega^2}$$

2) Capacitance for Series RLC Circuit given Q Factor Formula

Evaluate Formula

Formula

$$C = \frac{L}{Q_{se}^2 \cdot R^2}$$

Example with Units

$$351.1111\,\mu F = \frac{0.79\,mH}{0.025^2 \cdot 60\,\Omega^2}$$

3) Inductance for Parallel RLC Circuit using Q Factor Formula

Evaluate Formula

Formula

$$L = \frac{C \cdot R^2}{Q_{||}^2}$$

Example with Units

$$0.7915\,mH = \frac{350\,\mu F \cdot 60\,\Omega^2}{39.9^2}$$

4) Inductance for Series RLC Circuit given Q Factor Formula

Evaluate Formula

Formula

$$L = C \cdot Q_{se}^2 \cdot R^2$$

Example with Units

$$0.7875\,mH = 350\,\mu F \cdot 0.025^2 \cdot 60\,\Omega^2$$

5) Line to Neutral Voltage using Reactive Power Formula

Evaluate Formula

Formula

$$V_{ln} = \frac{Q}{3 \cdot \sin(\Phi) \cdot I_{ln}}$$

Example with Units

$$68.7179\,V = \frac{134\,VAR}{3 \cdot \sin(30°) \cdot 1.3\,A}$$

6) Q Factor for Parallel RLC Circuit Formula

Evaluate Formula

Formula

$$Q_{||} = R \cdot \left(\sqrt{\frac{C}{L}}\right)$$

Example with Units

$$39.9367 = 60\,\Omega \cdot \left(\sqrt{\frac{350\,\mu F}{0.79\,mH}}\right)$$

7) Q Factor for Series RLC Circuit Formula

Evaluate Formula

Formula

$$Q_{se} = \frac{1}{R} \cdot \left(\sqrt{\frac{L}{C}} \right)$$

Example with Units

$$0.025 = \frac{1}{60\,\Omega} \cdot \left(\sqrt{\frac{0.79\,\text{mH}}{350\,\mu\text{F}}} \right)$$

8) Resistance for Parallel RLC Circuit using Q Factor Formula

Evaluate Formula

Formula

$$R = \frac{Q_{||}}{\sqrt{\frac{C}{L}}}$$

Example with Units

$$59.9449\,\Omega = \frac{39.9}{\sqrt{\frac{350\,\mu\text{F}}{0.79\,\text{mH}}}}$$

9) Resistance for Series RLC Circuit given Q Factor Formula

Evaluate Formula

Formula

$$R = \frac{\sqrt{L}}{Q_{se} \cdot \sqrt{C}}$$

Example with Units

$$60.0952\,\Omega = \frac{\sqrt{0.79\,\text{mH}}}{0.025 \cdot \sqrt{350\,\mu\text{F}}}$$

10) Resonant Frequency for RLC circuit Formula

Evaluate Formula

Formula

$$f_o = \frac{1}{2 \cdot \pi \cdot \sqrt{L \cdot C}}$$

Example with Units

$$302.6722\,\text{Hz} = \frac{1}{2 \cdot 3.1416 \cdot \sqrt{0.79\,\text{mH} \cdot 350\,\mu\text{F}}}$$

11) RMS Voltage using Reactive Power Formula

Evaluate Formula

Formula

$$V_{rms} = \frac{Q}{I_{rms} \cdot \sin(\Phi)}$$

Example with Units

$$57.0213\,\text{V} = \frac{134\,\text{VAR}}{4.7\,\text{A} \cdot \sin(30°)}$$

12) Voltage using Complex Power Formula

Evaluate Formula

Formula

$$V = \sqrt{S \cdot Z}$$

Example with Units

$$128.9796\,\text{V} = \sqrt{270.5\,\text{VA} \cdot 61.5\,\Omega}$$

13) Voltage using Reactive Power Formula

Evaluate Formula

Formula

$$V = \frac{Q}{I \cdot \sin(\Phi)}$$

Example with Units

$$127.619\,\text{V} = \frac{134\,\text{VAR}}{2.1\,\text{A} \cdot \sin(30°)}$$

Variables used in list of RLC Circuit Formulas above

- **C** Capacitance *(Microfarad)*
- f_o Resonant Frequency *(Hertz)*
- **I** Current *(Ampere)*
- I_{ln} Line to Neutral Current *(Ampere)*
- I_{rms} Root Mean Square Current *(Ampere)*
- **L** Inductance *(Millihenry)*
- **Q** Reactive Power *(Volt Ampere Reactive)*
- $Q_{||}$ Parallel RLC Quality Factor
- Q_{se} Series RLC Quality Factor
- **R** Resistance *(Ohm)*
- **S** Complex Power *(Volt Ampere)*
- **V** Voltage *(Volt)*
- V_{ln} Line to Neutral Voltage *(Volt)*
- V_{rms} Root Mean Square Voltage *(Volt)*
- **Z** Impedance *(Ohm)*
- **Φ** Phase Difference *(Degree)*

Constants, Functions, Measurements used in list of RLC Circuit Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **sin**, sin(Angle) *Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.*
- 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.*
- Measurement: **Electric Current** in Ampere (A) *Electric Current Unit Conversion*
- Measurement: **Power** in Volt Ampere Reactive (VAR), Volt Ampere (VA) *Power Unit Conversion*
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion*
- Measurement: **Frequency** in Hertz (Hz) *Frequency Unit Conversion*
- Measurement: **Capacitance** in Microfarad (µF) *Capacitance Unit Conversion*
- Measurement: **Electric Resistance** in Ohm (Ω) *Electric Resistance Unit Conversion*
- Measurement: **Inductance** in Millihenry (mH) *Inductance Unit Conversion*
- Measurement: **Electric Potential** in Volt (V) *Electric Potential Unit Conversion*

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