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Short Line Formulas

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List of 30 Short Line Formulas

Short Line

Current

1) Receiving End Current using Impedance (STL)

Open Calculator

fx $$I_r = \frac{V_s - V_r}{Z}$$

ex $$3.90625\text{A} = \frac{400\text{V} - 380\text{V}}{5.12\Omega}$$

2) Receiving End Current using Losses (STL)

Open Calculator

fx $$I_r = \sqrt{\frac{P_{loss}}{3 \cdot R}}$$

ex $$3.901372\text{A} = \sqrt{\frac{3000\text{W}}{3 \cdot 65.7\Omega}}$$

3) Receiving End Current using Receiving End Power (STL)

Open Calculator

fx $$I_r = \frac{P_r}{3 \cdot V_r \cdot \cos(\Phi_r)}$$

ex $$3.897595\text{A} = \frac{1150\text{W}}{3 \cdot 380\text{V} \cdot \cos(75^\circ)}$$

4) Receiving End Current using Sending End Angle (STL)

Open Calculator

fx $$I_r = \frac{(3 \cdot V_s \cdot I_s \cdot \cos(\Phi_s)) - P_{loss}}{3 \cdot V_r \cdot \cos(\Phi_r)}$$

ex $$3.850612\text{A} = \frac{(3 \cdot 400\text{V} \cdot 3.98\text{A} \cdot \cos(30^\circ)) - 3000\text{W}}{3 \cdot 380\text{V} \cdot \cos(75^\circ)}$$

5) Receiving End Current using Transmission Efficiency (STL)

Open Calculator

$$I_r = \eta \cdot V_s \cdot I_s \cdot \frac{\cos(\Phi_s)}{V_r \cdot \cos(\Phi_r)}$$

$$3.897074\text{A} = 0.278 \cdot 400\text{V} \cdot 3.98\text{A} \cdot \frac{\cos(30^\circ)}{380\text{V} \cdot \cos(75^\circ)}$$

6) Sending End Current using Losses (STL)

Open Calculator

$$I_s = \frac{3 \cdot V_r \cdot I_r \cdot \cos(\Phi_r) + P_{loss}}{3 \cdot V_s \cdot \cos(\Phi_s)}$$

$$3.994022\text{A} = \frac{3 \cdot 380\text{V} \cdot 3.9\text{A} \cdot \cos(75^\circ) + 3000\text{W}}{3 \cdot 400\text{V} \cdot \cos(30^\circ)}$$

7) Sending End Current using Sending End Power (STL)

Open Calculator

$$I_s = \frac{P_s}{3 \cdot V_s \cdot \cos(\Phi_s)}$$

$$3.979868\text{A} = \frac{4136\text{W}}{3 \cdot 400\text{V} \cdot \cos(30^\circ)}$$

8) Sending End Current using Transmission Efficiency (STL)

Open Calculator

$$I_s = \frac{V_r \cdot I_r \cdot \cos(\Phi_r)}{\eta \cdot V_s \cdot \cos(\Phi_s)}$$

$$3.982988\text{A} = \frac{380\text{V} \cdot 3.9\text{A} \cdot \cos(75^\circ)}{0.278 \cdot 400\text{V} \cdot \cos(30^\circ)}$$

9) Transmitted Current (SC Line)

Open Calculator

$$I_t = \frac{V_t}{Z_0}$$

$$0.36036\text{A} = \frac{20\text{V}}{55.5\Omega}$$

Line Parameters

10) Impedance (STL)

Open Calculator

fx $$Z = \frac{V_s - V_r}{I_r}$$

ex $$5.128205\Omega = \frac{400V - 380V}{3.9A}$$

11) Losses using Transmission Efficiency (STL)

Open Calculator

fx $$P_{loss} = \left(\frac{3 \cdot V_r \cdot I_r \cdot \cos(\Phi_r)}{\eta}\right) - (3 \cdot V_r \cdot I_r \cdot \cos(\Phi_r))$$

ex $$2988.533W = \left(\frac{3 \cdot 380V \cdot 3.9A \cdot \cos(75^\circ)}{0.278}\right) - (3 \cdot 380V \cdot 3.9A \cdot \cos(75^\circ))$$

12) Resistance using Losses (STL)

Open Calculator

fx $$R = \frac{P_{loss}}{3 \cdot I_r^2}$$

ex $$65.74622\Omega = \frac{3000W}{3 \cdot (3.9A)^2}$$

13) Transmission Efficiency (STL)

Open Calculator

fx $$\eta = \frac{V_r \cdot I_r \cdot \cos(\Phi_r)}{V_s \cdot I_s \cdot \cos(\Phi_s)}$$

ex $$0.278209 = \frac{380V \cdot 3.9A \cdot \cos(75^\circ)}{400V \cdot 3.98A \cdot \cos(30^\circ)}$$

14) Voltage Regulation in Transmission Line

Open Calculator

fx $$\%V = \left(\frac{V_s - V_r}{V_r}\right) \cdot 100$$

ex $$5.263158 = \left(\frac{400V - 380V}{380V}\right) \cdot 100$$

Power & Phase Difference

15) Receiving End Angle using Losses (STL)

Open Calculator

fx $$\Phi_r = a\cos\left(\frac{(3 \cdot V_s \cdot I_s \cdot \cos(\Phi_s)) - P_{loss}}{3 \cdot V_r \cdot I_r}\right)$$

ex $$75.19433^\circ = a\cos\left(\frac{(3 \cdot 400V \cdot 3.98A \cdot \cos(30^\circ)) - 3000W}{3 \cdot 380V \cdot 3.9A}\right)$$

16) Receiving End Angle using Receiving End Power (STL)

Open Calculator

fx $$\Phi_r = a\cos\left(\frac{P_r}{3 \cdot V_r \cdot I_r}\right)$$

ex $$75.00947^\circ = a\cos\left(\frac{1150W}{3 \cdot 380V \cdot 3.9A}\right)$$

17) Receiving End Angle using Transmission Efficiency (STL)

Open Calculator

fx $$\Phi_r = a\cos\left(\eta \cdot V_s \cdot I_s \cdot \frac{\cos(\Phi_s)}{I_r \cdot V_r}\right)$$

ex $$75.01152^\circ = a\cos\left(0.278 \cdot 400V \cdot 3.98A \cdot \frac{\cos(30^\circ)}{3.9A \cdot 380V}\right)$$

18) Receiving End Power (STL)

Open Calculator

fx $$P_r = 3 \cdot V_r \cdot I_r \cdot \cos(\Phi_r)$$

ex $$1150.709W = 3 \cdot 380V \cdot 3.9A \cdot \cos(75^\circ)$$

19) Sending End Angle using Receiving End Parameters (STL)

Open Calculator

fx $$\Phi_s = a\cos\left(\frac{V_r \cdot \cos(\Phi_r) + (I_r \cdot R)}{V_s}\right)$$

ex $$27.56913^\circ = a\cos\left(\frac{380V \cdot \cos(75^\circ) + (3.9A \cdot 65.7\Omega)}{400V}\right)$$

20) Sending End Angle using Sending End Power (STL)

Open Calculator

fx $$\Phi_s = a\cos\left(\frac{P_s}{V_s \cdot I_s \cdot 3}\right)$$

ex $$30.00329^\circ = a\cos\left(\frac{4136W}{400V \cdot 3.98A \cdot 3}\right)$$

21) Sending End Power (STL)

Open Calculator

fx $$P_s = 3 \cdot I_s \cdot V_s \cdot \cos(\Phi_s)$$

ex $$4136.137W = 3 \cdot 3.98A \cdot 400V \cdot \cos(30^\circ)$$

22) Transmitted Current (SC Line)

Open Calculator

fx $$I_t = \frac{V_t}{Z_0}$$

ex $$0.36036A = \frac{20V}{55.5\Omega}$$

Voltage

23) Receiving End Voltage using Impedance (STL)

Open Calculator

fx $$V_r = V_s - (I_r \cdot Z)$$

ex $$380.032V = 400V - (3.9A \cdot 5.12\Omega)$$

24) Receiving End Voltage using Receiving End Power (STL)

Open Calculator

$$V_r = \frac{P_r}{3 \cdot I_r \cdot \cos(\Phi_r)}$$

$$379.7657\text{V} = \frac{1150\text{W}}{3 \cdot 3.9\text{A} \cdot \cos(75^\circ)}$$

25) Receiving End Voltage using Transmission Efficiency (STL)

Open Calculator

$$V_r = \eta \cdot V_s \cdot I_s \cdot \frac{\cos(\Phi_s)}{I_r \cdot \cos(\Phi_r)}$$

$$379.7149\text{V} = 0.278 \cdot 400\text{V} \cdot 3.98\text{A} \cdot \frac{\cos(30^\circ)}{3.9\text{A} \cdot \cos(75^\circ)}$$

26) Sending End Voltage in Transmission Line

Open Calculator

$$V_s = \left(\frac{\%V \cdot V_r}{100}\right) + V_r$$

$$399.988\text{V} = \left(\frac{5.26 \cdot 380\text{V}}{100}\right) + 380\text{V}$$

27) Sending End Voltage using Power Factor(STL)

Open Calculator

$$V_s = \sqrt{((V_r \cdot \cos(\Phi_r)) + (I_r \cdot R))^2 + ((V_r \cdot \sin(\Phi_r)) + (I_r \cdot X_c))^2}$$

$$510.9091\text{V} = \sqrt{((380\text{V} \cdot \cos(75^\circ)) + (3.9\text{A} \cdot 65.7\Omega))^2 + ((380\text{V} \cdot \sin(75^\circ)) + (3.9\text{A} \cdot 0.2\Omega))^2}$$

28) Sending End Voltage using Sending End Power (STL)

Open Calculator

$$V_s = \frac{P_s}{3 \cdot I_s \cdot \cos(\Phi_s)}$$

$$399.9867\text{V} = \frac{4136\text{W}}{3 \cdot 3.98\text{A} \cdot \cos(30^\circ)}$$

29) Sending End Voltage using Transmission Efficiency (STL)

Open Calculator

fx $$V_s = V_r \cdot I_r \cdot \frac{\cos(\Phi_r)}{\eta \cdot I_s \cdot \cos(\Phi_s)}$$

ex $$400.3003\text{V} = 380\text{V} \cdot 3.9\text{A} \cdot \frac{\cos(75^\circ)}{0.278 \cdot 3.98\text{A} \cdot \cos(30^\circ)}$$

30) Transmitted Inductance (SC Line)

Open Calculator

fx $$Z_0 = \frac{V_t}{I_t}$$

ex $$55.55556\Omega = \frac{20\text{V}}{0.36\text{A}}$$

Variables Used

- **%V** Voltage Regulation
- I_r Receiving End Current *(Ampere)*
- I_s Sending End Current *(Ampere)*
- I_t Transmitted Current *(Ampere)*
- P_{loss} Power Loss *(Watt)*
- P_r Receiving End Power *(Watt)*
- P_s Sending End Power *(Watt)*
- **R** Resistance *(Ohm)*
- V_r Receiving End Voltage *(Volt)*
- V_s Sending End Voltage *(Volt)*
- V_t Transmitted Voltage *(Volt)*
- X_c Capacitive Reactance *(Ohm)*
- **Z** Impedance *(Ohm)*
- Z_0 Characteristic Impedance *(Ohm)*
- η Transmission Efficiency
- Φ_r Receiving End Phase Angle *(Degree)*
- Φ_s Sending End Phase Angle *(Degree)*

Constants, Functions, Measurements used

- Function: **acos**, acos(Number)
  The inverse cosine function, is the inverse function of the cosine function. It is the function that takes a ratio as an input and returns the angle whose cosine is equal to that ratio.
- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: **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.
- 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: **Electric Current** in Ampere (A)
  Electric Current Unit Conversion
- Measurement: **Power** in Watt (W)
  Power Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Electric Resistance** in Ohm (Ω)
  Electric Resistance Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion

Check other formula lists

- **Line Performance Characteristics Formulas**
- **Long Transmission Line Formulas**
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