

# Energy Transmission Systems

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Project 02 Question 01

Project02q1

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Energy Transmission Systems  
Project 0201

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Inputs

Conductor diameter (in) :	<input type="text" value="0.681"/>
Insulation Thickness (in) :	<input type="text" value="345"/>
Metal Sheath Thickness (mil):	<input type="text" value="105"/>
Length (mi):	<input type="text" value="10"/>
Conductor ac resistance ( $\Omega$ /mi/phase):	<input type="text" value="0.190"/>
Frequency (Hz) :	<input type="text" value="60"/>
Conductor Size (kcmil) :	<input type="text" value="350"/>
Three Phase Voltage (kV)	<input type="text" value="35"/>
Degree ( $^{\circ}$ C):	<input type="text" value="50"/>

Calculate

Results

Mutual reactance between conductors and sheath :	<input type="text" value="0.9245 &lt;math&gt;\Omega&lt;/math&gt;/phase"/>
Sheath resistance of cable :	<input type="text" value="12.9049 &lt;math&gt;\Omega&lt;/math&gt;/phase"/>
Increase in conductor resistance due to sheath currents :	<input type="text" value="0.0659 &lt;math&gt;\Omega&lt;/math&gt;/phase"/>
Total resistance of conductor including sheath loss :	<input type="text" value="1.9659 &lt;math&gt;\Omega&lt;/math&gt;/phase"/>
Ratio of sheath loss to conductor loss :	<input type="text" value="3.47%"/>
Total sheath losses of feeder in watts if current in conductor is 400 A :	<input type="text" value="31626 W"/>

Project02q2

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Project 0202&0203

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Inputs

Frequency (Hz) : 60

Maximum usage of voltage (kV) : 13.8

Conductor diameter (in) : 0.539

Sector Factor : 0.71

Dielectric Constant (K) : 3.7

Insulation Thickness (mil) : 175

Choose to calculate

☒ Shielded

☐ Unshielded

Calculations

Shunt Capacitance (C0 C1 C2) :

C0 : 0.93  $\mu$ F/mi/phase

C1 : 0.93  $\mu$ F/mi/phase

C2 : 0.93  $\mu$ F/mi/phase

Shunt Capacitive (X0 X1 X2) :

X0 : 2.87 k $\Omega$ /mi/phase

X1 : 2.87 k $\Omega$ /mi/phase

X2 : 2.87 k $\Omega$ /mi/phase

Charging Current (I0 I1 I2) :

I0 : 1.608 A/mi/phase

I1 : 1.608 A/mi/phase

I2 : 1.608 A/mi/phase

Project02q2

Energy Transmission Systems  
Project 0202&0203

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Inputs

Frequency (Hz) : 60

Maximum usage of voltage (kV) : 13.8

Conductor diameter (in) : 0.539

Sector Factor : 0.71

Dielectric Constant (K) : 3.7

Insulation Thickness (mil) : 175

Choose to calculate

☐ Shielded

☒ Unshielded

Calculations

Shunt Capacitance (C0 C1 C2) :

C0 : 0.93  $\mu$ F/mi/phase

C1 : 2.78  $\mu$ F/mi/phase

C2 : 2.78  $\mu$ F/mi/phase

Shunt Capacitive (X0 X1 X2) :

X0 : 2.52 M $\Omega$ /mi/phase

X1 : 0.96 k $\Omega$ /mi/phase

X2 : 0.96 k $\Omega$ /mi/phase

Charging Current (I0 I1 I2) :

I0 : 1.608 A/mi/phase

I1 : 4.828 A/mi/phase

I2 : 4.828 A/mi/phase

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Inputs

Magnitude

Phase

Va :

7.3

12.5

V

Vb :

0.4

-100

V

Vc :

4.4

154

V

Calculate

Calculations

Va0 :

1.47 < 45.1 V

Va1 :

3.97 < 20.5 V

Va2 :

2.52 < -19.7 V

Vb0 :

1.47 < 45.1 V

Vb1 :

3.97 < -99.5 V

Vb2 :

2.52 < 100.3 V

Vc0 :

1.47 < 45.1 V

Vc1 :

3.97 < 140.5 V

Vc2 :

2.52 < -139.7 V

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Inputs

Vabc :

First Column

Real

Imag

0

0

50

0

-50

0

Iabc :

First Column

Real

Imag

-5

0

0

5

-5

0

Calculate

Calculations

[V012]

0.0 < 90

V

28.8675 < 90

V

28.8675 < -90

V

[I012]

3.7268 < 153.4

A

2.3570 < 165

A

2.3570 < -75

A

Three-phase complex power using Vabc and Iabc :

353.5534 < -45 VA

Three-phase complex power using V012 and I012 :

353.5534 < -45 VA

Note : If Columns dont have any real or imaginary number please put zero '0' inside the box