Exp - 02

Transmission Line Parameters of Bundled Conductor

Aim:

To find the Inductance and Capacitance of three phase bundle conductor using MATLAB program.

Apparatus Required:

SI.No	Apparatus	Specification
1	PC	Dual core, RAM 512 MB 1.2 GHz speed, 80 GB
2	MATLAB	7.5

Formula:

Equivalent Inductance $L = 0.2 \times \log\left(D_m / D_s \right)$

Equivalent Capacitance $C = 0.056 / \log\left(D_m / D_{sc} \right)$

$D_{SC} = 1.09 \times \left(R \times d^3 \right)^{1/4}$

$D_S = 1.09 \left(D_m \times d^3 \right)^{1/4}$

$D_m = \left(D_{ab}\, D_{bc}\, D_{ca} \right)^{1/3}$

Theory:

An AC transmission line has resistance, inductance and capacitance uniformly distributed along its length. These are known as constants or parameters of the line .The performance of a transmission line depend to a considerable extent upon these constants. For instance, these constants determine whether the efficiency and voltage regulation of the line will be good or poor. Therefore, a sound concept of these constant is necessary in order to make the electrical design of a transmission line a technical success. Constants of transmission line are resistance, inductance and capacitance uniformly distributed along the whole length of the line.

Algorithm:

Step 1: Start the program

Step 2: Get the diameter of the conductor D and calculate the radius R, R = D/2

Step 3: Get the distance between the conductor A & B, B & C, C & A (D_{ab} D_{bc} D_{ca}) and calculate

$D_m = \sqrt[3]{D_{ab} \times D_{bc} \times D_{ca}}$

Step 4: Get the GMR value and bundled space (d) to calculate $D_{sc} = 1.09 (D_s \times d^3)^{1/4}$

Step 5: Calculate Inductance and capacitance using formula

$L=0.2 \log \left({}^{D_m}/_{D_{sc}}\right)$

$C= 0.056 / \log \left({}^{D_m}/_{D_{sc}}\right)$

Step 6: Calculate Inductive and Capacitive reactance

$X_L = 2\pi fL$ $X_c = 1/2\pi fC$

Step 7: Display the result

Step 8: Stop the program

Program:

```
clc;
clear all;
D=input('Enter diameter');
R=D/2
d=input ('Enter bundle space');
Dab=input('enter distance between a, b');
Dbc=input('Enter distance between b, c');
Dca=input('Enter distance between c, a;');
Ds=input('Enter GMR value'');
Dm=(Dab*Dbc*Dca)^(1/3);
Ds=1.09*(Ds*d^3)^(1/4);
L=0.2*log(Dm/Ds);
Dsc=1.09*(R*d^3)^(1/4);
C=0.056/log(Dm/Dsc);
XL=2*pi*50*L;
XC=1/(2*pi*50*C);
fprintf('Inductive % d H ',L);
fprintf('Capacitance% d F', C);
fprintf('Inductive reactance % d Ohm/km ', XL);
fprintf('Capactive reactance % dOhm/km', XC);
```

Result: