ELEMENTS OF POWER SYSTEM
Experiment 6

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Aim: To find line parameters of transmission line using MATLAB.

Apparatus Required: MATLAB 7.0 and above

Questions :

Develop program in MATLAB to determine

1) GMRL and GMRC for a composite conductor having 7 identical strandsof radius 'r' each.

```
clc;
clear all;
r=input('Input the radius of conductor = ');
n=input('Input number of identical strands = ');
GMR=r* (exp(-0.25) *2^6*3^ (6/7) *2^ (6/7))^(1/n);
fprintf('GMR = %.4f \n', GMR)
```

```
Input the radius of conductor = 1
Input number of identical strands = 7
GMR = 2.1767
>>
```

2) GMRL and GMRC of bundle conductor having bundle spacing of 'd'having total number of conductor 2, 3 (equilateral triangle configuration) or 4 (square configuration) each of radius 'r'.

```
clear all;
clc
Ds=input('Enter the GMR : ');
dia = input('Enter the diameter : ');
r=dia/2;
 nb=input('No of bundled conductor = ');
 d=input('Bundled spacing : ');
if nb==1, Dsb=Ds;rb=r;
elseif nb == 2, Dsb = (d*Ds)^(1/2); rb=(d*r)^(1/2);
elseif nb == 3, Dsb = (d^2*Ds)^(1/3); rb = (d^2*r)^(1/3);
elseif nb == 4, Dsb = 2^0.125*(d^3*Ds)^(1/4); rb=2^0.125*(d^3*r)^(1/4);
end
Dsb
```

```
Enter the GMR : 1
Enter the diameter : 2
No of bundled conductor = 4
Bundled spacing : 1

Dsb =

    1.0905
```

3) Develop program in MATLAB to determine line constants L and C for anoverhead 3- phase general transmission line considering following options:

I. Type of conductor

1. Single conductor
2. Bundle conductor (with configuration) II. Number of

Three phase circuits

1. Single circuit
2. Double circuit vertical configuration
3. Double circuit Horizontal configuration

IV. For double circuit configuration - the circuit arrangement

1. abc-c'b'a'
2. abc-a'b'c'

V. Whether the line is transposed or not

```
clc clear all; disp('I.Type
of Conductor')
fprintf('\t1.Single
```

```
Conductor\n')
fprintf('\t2.Bundle
Conductor\n'); fprintf('II.
Number of Three phase
circuits\n')
fprintf('\t1.Single
circuit\n');
fprintf('\t2.Double circuit
vertical configuration\n');
fprintf('\t3.Double Circuit
Horizontal
configuration\n');
ch=input('Enter the choice
: '); if ch==1
ch1=input('Enter the type
: '); if ch1==1
r=input('Enter the radius
of the conductor(in cm):
'); d=input('Enter the
distance(in cm) : '); L =
2e-7*log((d)/(0.7788*r));
C = (2*pi*8.854e-
12)/(log(d/r)); elseif
ch==2 r=input('Enter the
radius of the conductor(in
cm): '); d=input('Enter the
bundle spacing(in m) : ');
nb=input('Enter the
configuration(1,2,3,4) : ');
L = 2e-7*log((d)/(0.7788*r)); C
= (2*pi*8.854e-12)/(log(d/r));
end
elseif ch==2
 ch1=input('Enter the type :
'); if ch1==1
r=input('Enter the radius of the conductor(in cm): ');
S=input('enter row vector[S11,S22,S33] : ');
```

```
d=(S(1)*S(2)*S(3))^(1/3); L = (2e-
7)*log((d)/(0.7788*r)) C = (2*pi*8.854e-
12)/(log(d/r)) elseif ch1==2
r=input('Enter the radius of the conductor(in cm): ');
S=input('Enter the distances[S11,S22,S33] : ');
H=input('enter the Heights[H12,H23] : ');
S11 = S(1); S22 = S(2); S33 = S(3); H12 = H(1); H23 = H(2);
a1 = -S11/2 + j*H12; b1 = -S22/2 + j*0;
c1 = -S33/2 - j*H23; nph=input('Enter the configuration type(1 -
abc-c_b_a_\n 2 - abc-
a_b_c_) : ');
if nph == 1 a2 =
S33/2 - j*H23; b2 =
S22/2 + j*0; c2 =
S11/2 + j*H12;
elseif nph == 2 a2 =
S11/2 + j*H12; b2
= S22/2 + j*0; c2 =
S33/2 - j*H23; end
Da1b1 = abs(a1 - b1); Da1b2 = abs(a1 - b2);
Da1c1 = abs(a1 - c1); Da1c2 = abs(a1 - c2);
Db1c1 = abs(b1 - c1); Db1c2 = abs(b1 - c2);
Da2b1 = abs(a2 - b1); Da2b2 = abs(a2 - b2);
Da2c1 = abs(a2 - c1); Da2c2 = abs(a2 - c2);
Db2c1 = abs(b2 - c1); Db2c2 = abs(b2 - c2);
Da1a2 = abs(a1 - a2);
Db1b2 = abs(b1 - b2);
Dc1c2 = abs(c1 - c2);

DAB=(Da1b1*Da1b2* Da2b1*Da2b2)^0.25;
DBC=(Db1c1*Db1c2*Db2c1*Db2c2)^.25;
DCA=(Da1c1*Da1c2*Da2c1*Da2c2)^.25;
Ds1=(0.7788*r*Da1a2)^0.5; Dsc1=(r*Da1a2)^0.5;
Ds2=(0.7788*r*Db1b2)^0.5; Dsc2=(r*Db1b2)^0.5;
Ds3=(0.7788*r*Dc1c2)^0.5; Dsc3=(r*Dc1c2)^0.5;
DsfL=(Ds1*Ds2*Ds3)^(1/3); DsfC=(Dsc1*Dsc2*Dsc3)^(1/3);
```

```
GMD=(DAB*DBC*DCA)^(1/3);
L = 2e-7*log(GMD/DsfL) C =
(2*pi*8.854e-12)/log(GMD/DsfC)
elseif ch1==3
r=input('Enter the radius of the conductor(in cm): ');
S=input('Enter the distances[S11,S22,S33] : ');
S11 = input('Enter Distance between two circuits, S11 = ');
D12 = S(1); D23 = S(2); D13 = S(3); a1 = -(D13+S11/2); b1 = -
(D23+S11/2); c1 = -S11/2; nph=input('Enter the configuration
type(1 - abc-c_b_a_\n 2 - abc-
a_b_c_) : '); if
 nph == 1 a2 =
 S11/2; b2 =
 D12+S11/2; c2
 = D13+S11/2;
 elseif nph == 2
 a2 =
 D13+S11/2; b2
 = D12+S11/2;
 c2 = S11/2; end
 Da1b1 = abs(a1 - b1); Da1b2 = abs(a1 - b2);
 Da1c1 = abs(a1 - c1); Da1c2 = abs(a1 - c2);
 Db1c1 = abs(b1 - c1); Db1c2 = abs(b1 - c2);
 Da2b1 = abs(a2 - b1); Da2b2 = abs(a2 - b2);
 Da2c1 = abs(a2 - c1); Da2c2 = abs(a2 - c2);
 Db2c1 = abs(b2 - c1); Db2c2 = abs(b2 - c2);
 Da1a2 = abs(a1 - a2);
 Db1b2 = abs(b1 - b2);
 Dc1c2 = abs(c1 - c2);
 DAB=(Da1b1*Da1b2* Da2b1*Da2b2)^0.25;
 DBC=(Db1c1*Db1c2*Db2c1*Db2c2)^.25;
 DCA=(Da1c1*Da1c2*Da2c1*Da2c2)^.25;
 Ds1=(0.7788*r*Da1a2)^0.5; Dsc1=(r*Da1a2)^0.5;
 Ds2=(0.7788*r*Db1b2)^0.5; Dsc2=(r*Db1b2)^0.5;
 Ds3=(0.7788*r*Dc1c2)^0.5; Dsc3=(r*Dc1c2)^0.5;
 DsfL=(Ds1*Ds2*Ds3)^(1/3); DsfC=(Dsc1*Dsc2*Dsc3)^(1/3);
```

GMD=(DAB*DBC*DCA)^(1/3);
L = 2e-7*log((GMD)/(DsfL)) C =
(2*pi*8.854e-12)/(log((GMD)/DsfC)) end
end

```
I.Type of Conductor
    1.Single Conductor
    2.Bundle Conductor
II. Number of Three phase circuits\n
    1.Single circuit
    2.Double circuit vertical configuration
    3.Double Circuit Horizontal configuration
Enter the choice : 2
Enter the type : 1
Enter the radius of the conductor(in cm): 5
enter row vector[S11,S22,S33] : [50 50 50]

L =

    5.1052e-07


C =

    2.4160e-11
```

Conclusion:

With this experiment we have successfully implemented code for GMRL and GMRC.