

Scilab Textbook Companion for
Electrical Network
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Scilab numbering policy used in this document and the relation to the above book.

Exa Example (Solved example)

Eqn Equation (Particular equation of the above book)

AP Appendix to Example(Scilab Code that is an Appednix to a particular Example of the above book)

For example, Exa 3.51 means solved example 3.51 of this book. Sec 2.3 means a scilab code whose theory is explained in Section 2.3 of the book.

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Chapter 1

basic circuit concept

Scilab code Exa 1.1 example1

```
1 //Basic Circuit Concepts
2 //page no-1.9
3 //example1.1
4 disp("Current through 15Ohm resistor is given by:");
5 disp("I1=30/15");
6 I1=30/15
7 printf("current through 15Ohm resistor = %.2f Ampere
      ", I1)
8 disp("Current through 5Ohm resistor is given by:")
9 disp("I2=5+2");
10 I2=5+2
11 printf("current through 5ohm resistor = %.2f Ampere"
      , I2)
12 disp("R=100-30-5*I2/I1");
13 R=(100-30-5*I2)/I1
14 printf("R = %.2f Ohm", R);
```

Scilab code Exa 1.2 example2

```

1 //Basic Circuit Concepts
2 //page no-1.10
3 //example1.2
4 disp("from the given fig:")
5 disp("I2-I3=13");
6 disp("-20*I1+8*I2=0");
7 disp("-12*I1-16*I3=0");
8 //solving these equations in the matrix form
9 A=[0 1 -1;-20 8 0;-12 0 -16]
10 B=[13 0 0]'
11 disp("A=")
12 disp(A)
13 disp("B=")
14 disp(B)
15 X=inv(A)*B
16 disp("X=")
17 disp(X)
18 disp("I1 = 4Ampere")
19 disp("I2 = 10Ampere")
20 disp("I3 = -3Ampere")

```

Scilab code Exa 1.3 example3

```

1 //Basic Circuit Concepts
2 //pg no-1.11
3 //example 1.3
4 disp("Iaf=x")
5 disp("Ife=x-30")
6 disp("Ied=x+40")
7 disp("Idc=x-80")
8 disp("Icb=x-20")
9 disp("Iba=x-80")
10 disp("Applying KVL to the closed path AFEDCBA:")//
    Applying KVL to the path AFEDCBA
11 disp("x=4.1/0.1")

```

```

12 x=4.1/0.1;
13 Iaf=x;
14 printf("\nIaf = %.2 f Ampere", Iaf);
15 Ife=x-30
16 printf("\nIfe = %.2 f Ampere", Ife);
17 Ied=x+40;
18 printf("\nIed = %.2 f Ampere", Ied);
19 Idc=x-80;
20 printf("\nIdc = %.2 f Ampere", Idc);
21 Icb=x-20;
22 printf("\nIcb = %.2 f Ampere", Icb);
23 Iba=x-80;
24 printf("\nIba = %.2 f Ampere", Iba);

```

Scilab code Exa 1.4 example4

```

1 //Basic Circuit Concepts
2 //pg no- 1.12
3 //example 1.4
4 disp("Applying KVL to the closed path OBAO");//
   Applying KVL to the closed path OBAO
5 disp("3*x-3*y=2");
6 disp("Applying KVL to the closed path ABCA");//
   Applying KVL to the closed path ABCA
7 disp("9*x+12*y=4");
8 a=[3 -3;9 12];
9 b=[2 4] '
10 disp("a=")
11 disp(a)
12 disp("b=")
13 disp(b)
14 X=inv(a)*b;
15 disp(X)
16 disp("x=0.5714286 Ampere");
17 disp("y=-0.095238 Ampere");

```

```

18 disp(" Ioa=0.57A")
19 disp(" Iob=1-0.57")
20 Iob=1-0.57;
21 printf("\nIob = %2f A", Iob);
22 disp(" Iab = 0.095");
23 Iac=0.57-0.095;
24 printf("\nIac = %2f A", Iac);
25 disp(" Iab=1-0.57 + 0.095")
26 Iab=1-0.57 + 0.095;
27 printf("\nIob = %2f A", Iab)

```

Scilab code Exa 1.5 example5

```

1 //Basic Circuit Concepts
2 //pg no-1.12
3 //example 1.5
4 I1=2/5;
5 printf(" I1=2/5= %2f Ampere", I1)
6 I2=4/8;
7 printf("\nI2=4/8= %2f Ampere", I2)
8 printf("\nPotential difference between points x and
   y = Vxy = Vx-Vy")
9 printf("\nWriting KVL equations for the path x to y"
   )//Writing KVL equation from x to y
10 printf("\nVs+3*I1+4-3*I2-Vy=0")
11 printf("\nVs+3*(0.4) + 4- 3*(0.5) -Vy = 0")
12 printf("\nVs+3*I1+4-3*I2-Vy = 0")
13 printf("\nVx-Vy = -3.7")
14 printf("\nVxy = -3.7V")

```

Scilab code Exa 1.6 example6

```

1 //Basic Circuit Concepts

```

```

2 //pg no-1.13
3 //example 1.6
4 I1=20/15;
5 printf(" I1=2/5= %2f Ampere", I1)
6 I2=15/10;
7 printf("\nI2=4/8= %2f Ampere", I2)
8 disp(" Voltage between points A and B = VAB = VA-VB")
  ;
9 disp(" Writing KVL equations for the path A to B:");
  //Writing KVL equations for the path A to B
10 disp("VA - 5*I1 - 5 - 15 + 6*I2 - VB = 0");
11 disp("VA - VB = 5*1.33 + 5 + 15 + 6*1.5");
12 VAB=(5*1.33)+5+15-(6*1.5);
13 printf("VAB = %.2 f Volt", VAB)

```

Scilab code Exa 1.7 example7

```

1 //Basic Circuit Concepts
2 //page no-1.13
3 //example1.7
4 I1=5/2;
5 printf(" I1=2/5= %2f Ampere", I1)
6 I2=2;
7 printf("\nI2=4/8= %2f Ampere", I2)
8 disp(" Potential difference VAB = VA - VB");
9 disp(" Writing KVL equations for path A to B") //
  Writing KVL equations for path A to B
10 disp("VA - 2*I1 + 8 - 5*I2 - VB = 0");
11 disp("VA - VB = (2*2.5) - 8 5 + (5*2)");
12 VAB=(2*2.5) -8+(5*2)
13 printf("VAB = %.2 f Volt", VAB);

```

Scilab code Exa 1.8 example8

```

1 //Basic Circuit Concepts
2 //page no-1.14
3 //example1.8
4 I1=10/8;
5 printf(" I1=2/5= %2f Ampere", I1)
6 I2=5;
7 printf("\nI2=4/8= %2f Ampere", I2)
8 disp("Applying KVL to the path from A to B") //
   Applying KVL to the path from A to B
9 disp("VA - 3*I1 - 8 + 3*I2 - VB = 0");
10 disp("VA - VB = 3*1.25 + 8 - 3*5")
11 VAB= (3*1.25)+8-(3*5);
12 printf("VAB = %.2f Volt", VAB);

```

Scilab code Exa 1.12 example12

```

1 //Basic Circuit Concepts
2 //page no-1.17
3 //example1.12
4 disp("Applying KVL to the circuit :");
5 disp("50 - 5*I - 1.2*I - 16 = 0")
6 I=(50-16)/6.2;
7 printf("I= %.2f Amp", I);
8 P=50*I;
9 printf("\nPower delivered 50 V source = 50 * 5.48= %
   .2f W", P);

```

Scilab code Exa 1.13 example13

```

1 //Basic Circuit Concepts
2 //page no-1.18
3 //example1.13
4 disp("By Current Division formula ");

```

```
5 I4=4*(2/(2+4));
6 printf("I4 = 4 * (2/(2+4)) = %.2 f Amp", I4);
```

Scilab code Exa 1.14 example14

```
1 //Basic Circuit Concepts
2 //page no-1.19
3 //example1.14
4 disp("Applying KVL to the mesh");
5 disp("15 - 50*I - 50*I - 5*I");
6 I=15/105;
7 printf("I=15/105 = %.2 f Amp", I);
8 V=15-(50*0.143);
9 printf("\nVoltage at node 2 = 15 - 50*I = %.2 f Volt"
, V);
```

Scilab code Exa 1.15 example15

```
1 //Basic Circuit Concepts
2 //pg no.-1.20
3 //example 1.15
4 r1=3;
5 r2=2.33;
6 r3=6;
7 v1=18;
8 v2=5.985;
9 mprintf("\nApplying KCL at the node, \n(Va-18)/3+(Va
-5.985)/2.33+Va/6 = 0");
10 Va=((v1*r2*r3)+(v2*r1*r3))/((r2*r3)+(r1*r3)+(r1*r2))
;
11 printf("\nSolving the equation ,we get, \nVa = %.2 f V
",Va);
```

Chapter 2

Network Theorem 1

Scilab code Exa 2.1 example1

```
1 //Network Theorem-1
2 //pg no.-2.4
3 //example2.1
4 printf("\nConverting the two delta networks formed
      by resistors 4.5 Ohm, 3Ohm, and 7.5Ohm into
      equivalent star networks");
5 a=4.5;
6 b=3;
7 c=7.5;
8 R1= (a*c)/(a+b+c);
9 R2= (c*b)/(c+b+a);
10 R3= (a*b)/(a+b+c);
11 mprintf("\nR1=R6 = %.2 f Ohm \nR2=R5 = %.1 f Ohm \nR3=
      R4 = %.1 f Ohm", R1, R2, R3);
```

Scilab code Exa 2.2 example2

```
1 //Network Theorem-1
```

```

2 //pg no.-2.2
3 //example2.5
4 //converting delta network to star network
5 a=10;
6 b=10;
7 c=10;
8 R=(a*b)/(a+b+c);
9 printf("\nConverting the delta formed by three
        resistors of 10 Ohm into an equivalent star
        network");
10 mprintf("\nR1=R2=R3= %.3 f Ohm",R);

```

Scilab code Exa 2.3 example3

```

1 //Network Theorem-1
2 //pg no.-2.7
3 //example2.3
4 a=4;
5 b=3;
6 c=6;
7 //star to delta conversion
8 R1=c+a+((a*c)/b);
9 R2=c+b+((c*b)/a);
10 R3=a+b+((a*b)/c);
11 x=1.35;
12 y=0.9;
13 RAB=(c*(x+y))/(c+x+y);
14 printf("\nR1 = %.f Ohm",R1);
15 printf("\nR2 = %.1 f Ohm",R2);
16 printf("\nR3 = %.f Ohm",R3);
17 printf("\nThe network can be simplified as, \nRAB =
        %.2 f Ohm",RAB);

```

Scilab code Exa 2.5 example5

```
1 //Network Theorem-1
2 //pg no.-2.9
3 //example2.5
4 //converting delta network to star network
5 a=25;
6 b=20;
7 c=35;
8 R1=(b*c)/(a+b+c);
9 R2=(a*b)/(a+b+c);
10 R3=(a*c)/(a+b+c);
11 printf("\nConverting the delta formed by resistors
    20 Ohm ,25 Ohm, 35 Ohm into an equivalent star
    network");
12 printf("\nR1= %.2 f Ohm",R1);
13 printf("\nR2= %.2 f Ohm",R2);
14 printf("\nR3= %.2 f Ohm",R3);
```

Scilab code Exa 2.8 example8

```
1 //Network Theorem-1
2 //pg no.-2.15
3 //example2.8
4 a=5;
5 b=4;
6 c=3;
7 //Star to delta conversion
8 R1=a+b+((a*b)/c);
9 R2=c+b+((c*b)/a);
10 R3=a+c+((a*c)/b);
11 a1=6;
12 b1=4;
13 c1=8;
14 //Satr to delta conversion
```

```

15 R4=a1+b1+((a1*b1)/c1);
16 R5=c1+b1+((c1*b1)/a1);
17 R6=a1+c1+((a1*c1)/b1);
18 x=6.17;
19 y=9.78;
20 RAB=(x*y)/(x+y);
21 printf("\nConverting star network formed by 3 Ohm,4
      Ohm ,5 Ohm into equivalent delta network ");
22 mprintf("\nR1= %.2f Ohm \nR2= %.1f Ohm \nR3 = %.2f
      Ohm",R1,R2,R3);
23 printf("\nSimilarly , converting star network formed
      by 6 Ohm,4 Ohm ,8 Ohm into equivalent delta
      network");
24 mprintf("\nR4= %.f Ohm \nR5= %.2f Ohm \nR6 = %.f Ohm
      ",R4,R5,R6);
25 printf("\n Simplifying the parallel networks , we get
      \nRAB = %.2f Ohms",RAB);

```

Scilab code Exa 2.9 example9

```

1 //Network Theorem 1
2 //page no-2.18
3 //example2.9
4 disp("Applying KVL to mesh 1");
5 disp("10*I1-3*I2-6*I3=0");....//equation 1
6 disp("Applying KVL to mesh 2");
7 disp("-3*I1+10*I2=-5");....//equation 2
8 disp("Applying KVL to mesh 3");
9 disp("-6*I1+10*I3=25");....//equation 3
10 disp("Solving the three equations");
11 A=[10 -3 -6;-3 10 0;-6 0 10]//solving the equations
      in matrix form
12 B=[10 -5 25]'
13 X=inv(A)*B;
14 disp(X);

```

```
15 disp(" I1=4.27 A");
16 disp(" I2=0.78 A");
17 disp(" I3=5.06 A");
18 disp(" I5ohm=4.27 A");
```

Scilab code Exa 2.10 example10

```
1 //Network Theorem 1
2 //page no-2.19
3 //example 2.10
4 disp(" Applying KVL to mesh 1");
5 disp(" 7*I1-I2=10");....//equation 1
6 disp(" Applying KVL to mesh 2");
7 disp(" -I1+6*I2-3*I3=0");....//equation 2
8 disp(" Applying KVL to mesh 3");
9 disp(" -3*I2+13*I3=-20");....//equation 3
10 disp(" Solving the three equations");
11 A=[7 -1 0;-1 6 -3;0 -3 13];//solving the equations
    in matrix form
12 B=[10 0 -20]';
13 X=inv(A)*B;
14 disp(X);
15 disp(" I1=1.34 A");
16 disp(" I1=-0.62 A");
17 disp(" I3=-1.68 A");
18 disp(" I2ohm=1.34 A");
```

Scilab code Exa 2.11 example11

```
1 //Network Theorem 1
2 //page no-2.20
3 //example 2.11
4 disp(" Applying KVL to mesh 1");
```

```

5 disp("3*I1-I2-2*I3=8");....//equation 1
6 disp("Applying KVL to mesh 2");
7 disp("-I1+8*I2-3*I3=10");....//equation 2
8 disp("Applying KVL to mesh 3");
9 disp("-2*I1-3*I2+10*I3=12");....//equation 3
10 disp("Solving the three equations");
11 A=[3 -1 -2;-1 8 -3;-2 -3 10];//solving the equations
    in matrix form
12 B=[8 10 12] '
13 X=inv(A)*B;
14 disp(X);
15 disp("I1=6.01 A");
16 disp("I2=3.27 A");
17 disp("I3=3.38 A");
18 disp("I5ohm=3.38 A");

```

Scilab code Exa 2.12 example12

```

1 //Network Theorem 1
2 //page no-2.21
3 //example 2.12
4 disp("Applying KVL to mesh 1");
5 disp("8*I1-I2-4*I3=4");....//equation 1
6 disp("Applying KVL to mesh 2");
7 disp("-I1+8*I2-5*I3=0");....//equation 2
8 disp("Applying KVL to mesh 3");
9 disp("-4*I1-5*I2+15*I3=0");....//equation 3
10 disp("Solving the three equations");
11 A=[8 -1 -4;-1 8 -5;-4 -5 15];//solving the equations
    in matrix form
12 B=[4 0 0] '
13 X=inv(A)*B;
14 disp(X);
15 disp("I1=0.66");
16 disp("I2=0.24 A");

```

```
17 disp(" I3=0.26 A");
18 disp(" current supplied by the battery = 0.66 A");
```

Scilab code Exa 2.13 example13

```
1 //Network Theorem 1
2 //page no -2.22
3 //example 2.13
4 disp(" Applying KVL to mesh 1");
5 disp(" V+13*I1 -2*I2 -5*I3=20");...//mesh equation 1
6 disp(" Applying KVL to mesh 2");
7 disp(" 2*I1 -6*I2+I3=0");//mesh equation 2
8 disp(" Applying KVL to mesh 3");
9 disp(" V+5*I1+I2 -10*I3=0");//mesh equation 3
10 disp(" putting I1=0 in equation 1, 2 and 3 we get");
11 disp(" V-2*I2 -5*I3=20");....//equation 1
12 disp(" -6*I2+I3=0");....//equation 2
13 disp(" V+I2 -10*I3=0");....//equation 3
14 disp(" Solving the three equations");
15 A=[1 -2 -5;0 -6 1;1 1 -10];//solving the equations
    in matrix form
16 B=[20 0 0]';
17 X=inv(A)*B;
18 disp(X);
19 disp("V=43.7 V")
```

Scilab code Exa 2.14 example14

```
1 //Network Theorem 1
2 //page no -2.13
3 //example2.14
4 disp(" Mesh 1 contains a current source of 6A. Hence,
    we cannot write KVL equation for Mesh 1. direction
```

```

    of current source and mesh current I1 are same,"
);
5 disp(" I1=6A");....//equation 1
6 disp(" Applying KVL to mesh 2");
7 disp(" 18*I2-6*I3=108");....//equation 2
8 disp(" Applying KVL to mesh 3");
9 disp(" 6*I2-11*I3=9");....//equation 3
10 disp(" Solving the three equations");
11 A=[18 -6;6 -11];...//solving the equations in matrix
    form
12 B=[108 9]';
13 X=inv(A)*B;
14 disp(X);
15 disp(" I3 = 3A");
16 disp(" I2ohm = 3A");

```

Scilab code Exa 2.15 example15

```

1 //Network Theorem 1
2 //page no-2.23
3 //example2.15
4 disp("from the fig ,");
5 disp(" IA=I1");....//equation 1
6 disp(" IB=I2");....//equation 2
7 disp(" Applying Kvl to mesh 1:");
8 disp(" 5-5*I1-10*IB-10*(I1-I2)-5*IA=0");
9 disp(" 5-5*I1-10*I2-10*I1+10*I2-5*I1=0");
10 disp(" -20*I1=-5");
11 I1=5/20;
12 printf(" I1= %.2f A" , I1);....//equation 3
13 disp(" Applying Kvl to mesh 2:");
14 disp(" 15*I1-15*I2=10");....//equation 4
15 disp(" Put I1=0.25 A in equation 4");
16 disp(" -6.25=15*I2");
17 I2=-6.25/15;

```



```
18 printf(" I2= %.2f A" , I2);
```

Scilab code Exa 2.17 example17

```
1 //Network Theorem 1
2 //page no-2.25
3 //example2.17
4 disp("from the fig ,");
5 disp("V1=-5*I1");....//equation 1
6 disp("V2=2*I2");....//equation 2
7 disp("Applying Kvl to mesh 1:");
8 disp("20*I1+3*I2=-5");....//equation 3
9 disp("Applying Kvl to mesh 2:");
10 disp("11*I1-3*I2=10");...//equation 4
11 disp("Solving equations 3 and 4");...//solving
    equations in matrix form
12 A=[20 3;11 -3];
13 B=[-5 10]';
14 X=inv(A)*B;
15 disp(X);
16 disp(" I1=0.161 A");
17 disp(" I2=-2.742 A");
```

Scilab code Exa 2.18 example18

```
1 //Network Theorem-1
2 //pg no.-2.25
3 //example2.18
4 disp("from the fig ,");
5 disp("Iy=I1");....//equation 1
6 disp("Ix=I1-I2");....//equation 2
7 disp("Applying Kvl to mesh 1:");
8 disp("-10*I1+3*I2=5");....//equation 3
```

```

9 disp("Applying Kvl to mesh 2:");
10 disp("-I1-3*I2=10");...//equation 4
11 disp("Solving equations 3 and 4");...//solving
    equations in matrix form
12 A=[-10 3;-1 -3];
13 B=[5 10]';
14 X=inv(A)*B;
15 disp(X);
16 disp("I1=-1.364 A");
17 disp("I2=-2.878 A");
18 x=-1.364;
19 y=-2.878;
20 Ix=x-y;
21 mprintf("\nIy = %.3f A \nIx = %.3f A",x,Ix);

```

Scilab code Exa 2.19 example19

```

1 //Network Theorem 1
2 //page no-2.26
3 //example2.19
4 disp("Applying KVL to mesh 1:");
5 disp("11*I1-10*I2=2");....//equation 1
6 disp("Writing current equation to supermesh:");
7 disp("I3-I2=4");....//equation 2
8 disp("Applying KVL to outer path of supermesh:");
9 disp("2*I1-3*I2-3*I3=0");....//equation 3
10 disp("solving these equations we get :");...//
    solving equations in matrix form
11 A=[11 -10 0;0 -1 1;2 -3 -3];
12 B=[2 4 0]';
13 X=inv(A)*B;
14 disp(X);
15 I1=-2.35
16 I2=-2.78
17 I3=1.22

```

```

18 I4=I1-I2;
19 printf("\ncurrent through the 10 ohm resistor = I1-
      I2 = %.2f A", I4);

```

Scilab code Exa 2.20 example20

```

1 //Network Theorem 1
2 //page no-2.26
3 //example2.20
4 disp("writing equation for supermesh,");
5 disp("I1-I3=7");....//equation 1
6 disp("Applying Kvl to the outer path of the
      supermesh:");
7 disp("-I1+4*I2-4*I3 = -7");....//equation 2
8 disp("Applying Kvl to mesh 2:");
9 disp("I1-6*I2+3*I3 = 0");...//equation 3
10 disp("Solving equations 1 ,2 and 3");...//solving
      equations in matrix form
11 A=[1 0 -1;-1 4 -4;1 -6 3];
12 B=[7 -7 0]';
13 X=inv(A)*B;
14 disp(X);
15 disp("I1=9 A");
16 disp("I2=-2.5 A");
17 disp("I3=-2 A");
18 x=2.5;
19 y=2;
20 z=x-y;
21 mprintf("\nCurrent through the 3-Ohm resistor = I2-
      I3 =%.1f A",z);

```

Scilab code Exa 2.21 example21

```

1 //Network Theorem 1
2 //page no-2.27
3 //example2.21
4 disp("Applying KVL to mesh 1:");
5 disp("15*I1-10*I2-5*I3=50");....//equation 1
6 disp("Writing current equation to supermesh:");
7 disp("I2-I3=2 A");....//equation 2
8 disp("Applying KVL to outer path of supermesh:");
9 disp("-15*I1+12*I2+6*I3=0");....//equation 3
10 disp("solving these equations we get :");...//
    solving equations in matrix form
11 A=[15 -10 -5;0 1 -1;-15 12 6];
12 B=[50 2 0]';
13 X=inv(A)*B;
14 disp(X);
15 I1=20
16 I2=17.33
17 I3=15.33
18 I4=I1-I3;
19 printf("\ncurrent through the 5 ohm resistor = I1-I3
    = %.2f A", I4);

```

Scilab code Exa 2.22 example22

```

1 //Network Theorem 1
2 //page no-2.28
3 //example2.22
4 disp("from the fig,");
5 disp("I4=40");....//equation 1
6 disp("\nmeshes 2 and 3 form a supermesh. current
    equation for supermesh,")
7 disp("-I1+2*I2-I3 = 0");....//equation 2
8 disp("Applying Kvl to supermesh:");
9 disp("-1/5(I2-I1) -1/20*I2 -1/15*I3 -1/2(I3-I4)=0")
    ;....//equation 3

```

```

10 disp("applying KVL to mesh 1");
11 disp("-1/10*I1 -1/5(I1-I2) -1/6(I1-I4)=6");...//
    equation 4
12 disp("Solving equations 1 ,2 ,3 and 4");...//solving
    equations in matrix form
13 A=[0 0 0 1;-1 2 -1 0;0.2 -0.25 -17/30 0.5;-7/15 0.2
    0 1/6];
14 B=[40 0 0 6]';
15 X=inv(A)*B;
16 disp(X);
17 disp("I1=10 A");
18 disp("I2=-20 A");
19 disp("I3=30 A");
20 disp("I4=40 A");

```

Scilab code Exa 2.24 example24

```

1 //Network Theorem 1
2 //page no-2.29
3 //example2.24
4 disp("Applying KCL to node 1:");
5 disp("2*V1-V2 = 2");...//equation 1
6 disp("Applying KCL to node 2:");
7 disp("3*V2-V1 = 4");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
    equations in matrix form
9 A=[2 -1;-1 3];
10 B=[2 4]';
11 X=inv(A)*B;
12 disp(X);
13 disp("V1= 2 V");
14 disp("V2=-2 V");

```

Scilab code Exa 2.25 example25

```
1 //Network Theorem 1
2 //page no-2.30
3 //example2.25
4 disp("Applying KCL to node 1:");
5 disp("8*VA-2*VB = 50");....//equation 1
6 disp("Applying KCL to node 2:");
7 disp("-3*VA+9*VB = 85");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
   equations in matrix form
9 A=[8 -2;-3 9];
10 B=[50 85]';
11 X=inv(A)*B;
12 disp(X);
13 disp("VA= 9.39 V");
14 disp("VB= 12.58 V");
```

Scilab code Exa 2.26 example26

```
1 //Network Theorem 1
2 //page no-2.30
3 //example2.26
4 disp("Applying KCL to node 1:");
5 disp("5*V1-2*V2 = -24");....//equation 1
6 disp("Applying KCL to node 2:");
7 disp("10*V1-31*V2+6*V3 = 300");...//equation 2
8 disp("Applying KCL to node 3:");
9 disp("-4*V2 +9*V3 = 160");...//equation 3
10 disp("Solving equations 1,2 and 3");...//solving
   equations in matrix form
11 A=[5 -2 0;10 -31 6;0 -4 9];
12 B=[-24 300 160]';
13 X=inv(A)*B;
14 disp(X);
```

```

15 disp("V1= -8.77 V");
16 disp("V2= -9.92 V");
17 disp("V3= 13.37 V");
18 x=13.37;
19 y=-9.92;
20 z=(x-y)/5;
21 printf("\ncurrent through the 5 ohm resistor = V3-V2
        /5 = %.2f A",z);

```

Scilab code Exa 2.27 example27

```

1 //Network Theorem 1
2 //page no-2.31
3 //example2.27
4 disp("Applying KCL to node 1:");
5 disp("50*V1-20*V2 = 2400");...//equation 1
6 disp("Applying KCL to node 2:");
7 disp("-10*V1+19*V2 = 240");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
    equations in matrix form
9 A=[50 -20;-10 19];
10 B=[2400 240]';
11 X=inv(A)*B;
12 disp(X);
13 disp("V1= 67.2 V");
14 disp("V2=-48 V");

```

Scilab code Exa 2.28 example28

```

1 //Network Theorem 1
2 //page no-2.32
3 //example2.28
4 disp("Applying KCL to node 1:");

```

```

5 disp("4*VA-2*VB = 5");...//equation 1
6 disp("Applying KCL to node 2:");
7 disp("-2*VA+3*VB = 4");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
   equations in matrix form
9 A=[4 -2;-2 3];
10 B=[5 4]';
11 X=inv(A)*B;
12 disp(X);
13 disp("VA= 2.88 V");
14 disp("VB= 3.25 V");

```

Scilab code Exa 2.29 example29

```

1 //Network Theorem 1
2 //page no-2.33
3 //example2.29
4 disp("Applying KCL to node 1:");
5 disp("4*V1-2*V2-V3 = -24");...//equation 1
6 disp("Applying KCL to node 2:");
7 disp("-50*V1+71*V2-20*V3 = 0");...//equation 2
8 disp("Applying KCL to node 3:");
9 disp("-5V1-4*V2 +10*V3 = 180");...//equation 3
10 disp("Solving equations 1,2 and 3");...//solving
   equations in matrix form
11 A=[4 -2 -1;-50 71 -20;-5 -4 10];
12 B=[-24 0 180]';
13 X=inv(A)*B;
14 disp(X);
15 disp("V1= 6.35 V");
16 disp("V2= 11.76 V");
17 disp("V3= 25.88 V");
18 x=25.88;
19 y=11.76;
20 z=(x-y);

```



```
21 printf("\ncurrent through the 5 ohm resistor = V3-V2
    /5 = %.2f A",z);
```

Scilab code Exa 2.30 example30

```
1 //Network Theorem 1
2 //page no-2.34
3 //example2.30
4 disp("Applying KCL to node 1:");
5 disp("8*V1-V2 = 50");...//equation 1
6 disp("Applying KCL to node 2:");
7 disp("-2*V1+11*V2 = -500");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
    equations in matrix form
9 A=[8 -1;-2 17];
10 B=[50 -500]';
11 X=inv(A)*B;
12 disp(X);
13 disp("V1= 2.61 V");
14 disp("V2=-29.1 V");
15 x=2.61;
16 y=-29.1;
17 I1=-x/2;
18 I2=(x-y)/10; //current through 10 Ohm resistor
19 I3=(y+50)/2; //50 volts is the supply to the circuit
20 mprintf("\nI1= %.2f A \nI2= %.2f A \nI3= %.2f A",I1,
    I2,I3);
```

Scilab code Exa 2.31 example31

```
1 //Network Theorem 1
2 //page no-2.34
3 //example2.30
```

```

4 disp("Applying KCL to node a:");
5 disp("0.5*Va-0.2*Vb = 34.2");...//equation 1
6 disp("Applying KCL to node b:");
7 disp("0.1*Va-0.4*Vb = -32.4");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
   equations in matrix form
9 A=[0.5 -0.2;0.1 -0.4];
10 B=[34.2 -32.4] '
11 X=inv(A)*B;
12 disp(X);
13 disp("Va= 112 V");
14 disp("Vb= 109 V");
15 x=112;
16 y=109;
17 I1=(120-x)/0.2;
18 I2=(x-y)/0.3;
19 I3=(110-y)/0.1;
20 mprintf("\nI1= %.f A \nI2= %.f A \nI3= %.f A",I1,I2,
   I3);

```

Scilab code Exa 2.32 example32

```

1 //Network Theorem 1
2 //page no-2.35
3 //example2.35
4 disp("Applying KCL to node 1:");
5 disp("V1 = 50");...//equation 1
6 disp("Applying KCL to node 2:");
7 disp("-2*V1+17*V2 = 50");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
   equations in matrix form
9 A=[1 0;-2 17];
10 B=[50 50] '
11 X=inv(A)*B;
12 disp(X);

```

```

13 disp("V1= 50 V");
14 disp("V2= 8.82 V");
15 x=8.82;
16 y=(x/10);
17 printf("\ncurrent in the 10-Ohm resistor =V2/10 =%.2
      f A",y);

```

Scilab code Exa 2.33 example33

```

1 //Network Theorem 1
2 //page no-2.36
3 //example2.33
4 disp("Applying KCL to node a:");
5 disp("6*Va-5*Vb = -20");...//equation 1
6 disp("Applying KCL to node b:");
7 disp("-10*Va+17*Vb-5*Vc = 0");...//equation 2
8 disp("At node c");
9 disp("Vc = 20");
10 disp("Solving equations 1,2 and 3");...//solving
    equations in matrix form
11 A=[6 -5 0;-10 17 -5;0 0 1];
12 B=[-20 0 20]';
13 X=inv(A)*B;
14 disp(X);
15 disp("Va= 3.08 V");
16 disp("Vb= 7.69 V");
17 x=3.08;
18 y=7.69;
19 z=20;
20 Va = x-y;
21 Vb = y-z;
22 mprintf("\nV1 = Va-Vb =%.2 f V \nV2 = Vb-Vc =%.2 f V",
      Va,Vb);

```

Scilab code Exa 2.34 example34

```
1 //Network Theorem 1
2 //page no-2.37
3 //example2.334
4 disp("At node A:");
5 disp("VA = 60");...//equation 1
6 disp("Applying KCL to node B:");
7 disp("-VA+3*VB-VC = 12");...//equation 2
8 disp("Applying KCL to node C:");
9 disp("-2*VA-5*VB+10*VC");...//equation 3
10 disp("Solving equations 1,2 and 3");...//solving
    equations in matrix
11 A=[1 0 0;-1 3 -1;-2 -5 10];
12 B=[60 12 24] '
13 X=inv(A)*B;
14 disp(X);
15 disp("VC= 31.68 V");
16 disp("Voltage across the 100 Ohm resistor = 31.68 V"
    );
```

Scilab code Exa 2.35 example35

```
1 //Network Theorem 1
2 //page no-2.38
3 //example2.35
4 disp("Applying KCL to node 1:");
5 disp("2.5*V1-0.5*V2 = 5");...//equation 1
6 disp("Applying KCL to node 2:");
7 disp("V1-V2 = 0");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
    equations in matrix form
```

```

9 A=[2.5 -0.5;1 -1];
10 B=[5 0]';
11 X=inv(A)*B;
12 disp(X);
13 disp("V1= 2.5 V");
14 disp("V2=-2.5 V");

```

Scilab code Exa 2.37 example37

```

1 //Network Theorem 1
2 //page no-2.39
3 //example2.37
4 disp("Applying KCL to node 1:");
5 disp("2*V1+17*V2 = 0");....//equation 1
6 disp("Applying KCL to node 2:");
7 disp("V1+6V2 = 0");...//equation 2
8 disp("Solving equations 1 and 2");...//solving
   equations in matrix form
9 A=[2 17;1 6];
10 B=[0 0]';
11 X=inv(A)*B;
12 disp(X);
13 disp("V1= 0 V");
14 disp("V2= 0 V");

```

Scilab code Exa 2.38 example38

```

1 //Network Theorem 1
2 //page no-2.40
3 //example2.38
4 disp("Applying KCL to node a:");
5 disp("2*Va-0.5*Vb-0.5*Vc = 5");....//equation 1
6 disp("Applying KCL to node b:");

```

```

7 disp("-3/2*Va+5/6*Vb+2/3*Vc = -1");...//equation 2
8 disp("Applying KCL to node c:");
9 disp("1/2*Va+1/3*Vb-31/30*Vc = -1");...//equation 3
10 disp("Solving equations 1,2 and 3");...//solving
    equations in matrix form
11 A=[2 -0.5 -0.5;-3/2 5/6 2/3;0.5 1/3 -31/30 ];
12 B=[5 -1 0]';
13 X=inv(A)*B;
14 disp(X);
15 disp("Va= 4.303 V");
16 disp("Vb= 3.87 V");
17 disp("Vc= 3.33 V");

```

Scilab code Exa 2.39 example39

```

1 //Network Theorem 1
2 //page no-2.41
3 //example2.39
4 disp("from the figure");
5 disp("V4= 40 V");//equation 1
6 disp("nodes 2 and 3 form suoernode:");
7 disp("V1-2*V2+V3 = 0");//...//equation 2
8 disp("Applying KCL to node 1:");
9 disp("7/15*V1-1/5*V2 = 2/3");//...//equation 3
10 disp("Applying KCL to supernode :");
11 disp("-23/30*V1 +83/60*V3 = 20");//...//equation 4
12 disp("Solving equations 1,2,3 and 4");//...//solving
    equations in matrix form
13 A=[0 0 0 1;1 -2 1 0;7/15 -1/5 0 0;-23/30 83/60 0 0];
14 B=[40 0 2/3 20]';
15 X=inv(A)*B;
16 disp(X);
17 disp("V1= 10 V");
18 disp("V2= 20 V");
19 disp("V3= 30 V");

```

Scilab code Exa 2.40 example40

```
1 //Network Theorem 1
2 //page no-2.42
3 //example2.40
4 disp("selecting central node as reference node");
5 disp("V1= -12 V");//equation 1
6 disp("Applying KCL at node 1:");
7 disp("-2*V1+2.5*V2-0.5V3 = 14");//equation 2
8 disp("nodes 3 and 4 form a supernode");
9 disp("0.2*V1+V3-1.2*V4 = 0");//equation 3
10 disp("Applying KCL to supernode :");
11 disp("0.1*V1-V2+0.5*V3+1.4*V4 = 0");//equation 4
12 disp("Solving equations 1,2,3 and 4");//solving
    equations in matrix form
13 A=[1 0 0 0;-2 2.5 -0.5 0;0.2 0 1 -1.2;0.1 -1 0.5
    1.4];
14 B=[-12 14 0 0]';
15 X=inv(A)*B;
16 disp(X);
17 disp("V1= -12 V");
18 disp("V2= -4 V");
19 disp("V3= 0");
20 disp("V4= -2 V");
```

Chapter 3

Network Theorem 2

Scilab code Exa 3.1 example1

```
1 //Network Theorem 2
2 //pg no 3.2
3 //example 3.1
4 disp("When 10-V source is acting alone:");
5 disp("By current-division formula :");
6 I1=10*(0.87/(10+0.87));
7 printf("I1=10*(0.87/(10+0.87))= %.2f A (down)", I1);
8 disp("When 4 A source is acting alone:");
9 disp("By current-division formula :");
10 I2=2.86*(0.875/(10+0.875));
11 printf("I2=2.86*(0.875/(10+0.875))= %.2f A (down)",
        I2);
12 disp("By superposition theorem:");
13 I=I1+I2;
14 printf("\nI=I1+I2=0.8+0.23= %.2f A (down)", I);
```

Scilab code Exa 3.2 example2


```

1 //Network Theorem 2
2 //pg no 3.4
3 //example 3.2
4 disp("When 4-A source is acting alone:");
5 disp("By current-division formula :");
6 I1=3.33*(3.53/(6+3.53));
7 printf("I1=3.33*(3.53/(6+3.53)) = %.2 f A (down)", I1
      );
8 disp("When 10-V source is acting alone:");
9 disp("By current-division formula :");
10 I2=0.833*(3.53/(6+3.53));
11 printf("I2=0.833*(3.53/(6+3.53))= %.2 f A (up)", I2);
12 disp("When 3-A source is acting alone:");
13 disp("By current-division formula :");
14 I3=3*(3.53/(6+3.53));
15 printf("I3=3*(3.53/(6+3.53))= %.2 f A (down)", I3);
16 disp("By superposition theorem:");
17 I=I1-I2+I3;
18 printf("\nI=I1-I2+I3=1.23-0.31+1.11= %.2 f A (down)",
      I);

```

Scilab code Exa 3.3 example3

```

1 //Network Theorem 2
2 //pg no 3.5
3 //example 3.3
4 disp("When 4-A source is acting alone:");
5 disp("By current-division formula :");
6 I1=4/(2+1);
7 printf("I1=4/(2+1) = %.2 f A (down)", I1);
8 disp("When 3-A source is acting alone:");
9 disp("By current-division formula :");
10 I2=3*(2/(2+1));
11 printf("I2=3*(2/(2+1)) = %.2 f A (down)", I2);
12 disp("When 1-A source is acting alone:");

```

```

13 disp("By current-division formula :");
14 I3=1*(2/(2+1));
15 printf("I3=1*(2/(2+1)) = %.2f A (down)", I3);
16 disp("By superposition theorem:");
17 I=I1+I2+I3;
18 printf("\nI=I1+I2+I3=1.33+2+0.66= %.2f A (down)", I)
    ;

```

Scilab code Exa 3.4 example4

```

1 //Network Theorem 2
2 //pg no 3.
3 //example 3.4
4 disp("When 6-V source is acting alone:");
5 VAB1=6;
6 printf("VAB1 = %.2f V", VAB1);
7 disp("When 10-V source is acting alone:");
8 disp("Since the resistor of 5 ohm is shorted ,the
    voltage across it is zero")
9 VAB2=10;
10 printf("VAB2= %.2f V", VAB2);
11 disp("When 5-A source is acting alone:");
12 disp("Due to short circuit in both the parts");
13 VAB3=0;
14 printf("VAB3 = %.2f V", VAB3);
15 disp("By superposition theorem:");
16 VAB=VAB1+VAB2+VAB3;
17 printf("\nVAB=VAB=VAB1+VAB2+VAB3= %.2f V", VAB);

```

Scilab code Exa 3.5 example5

```

1 //Network Theorem 2
2 //pg no 3.7

```

```

3 //example 3.5
4 disp("When 5-A source is acting alone:");
5 disp("By current-division formula :");
6 I1=5*(2/(2+4));
7 printf("I1=5*(2/(2+4)) = %.2f A (down)", I1);
8 disp("When 2-A source is acting alone:");
9 disp("By current-division formula :");
10 I2=2*(2/(2+4));
11 printf("I2=2*(2/(2+4)) = %.2f A (down)", I2);
12 disp("When 6-V source is acting alone:");
13 disp("Applying KVL to the mesh");
14 disp("-2*I3 -6-4*I3=0");
15 disp("I3=-1");
16 I3=-1;
17 printf("I3=-1 A= %.2f A (down)", I3);
18 disp("By superposition theorem:");
19 I=I1+I2+I3;
20 printf("\nI=I1+I2+I3=1.67+0.67-1= %.2f A (down)", I)
    ;

```

Scilab code Exa 3.6 example6

```

1 //Network Theorem 2
2 //pg no 3.8
3 //example 3.6
4 a=15/38;
5 b=10/38;
6 x=a+b;
7 mprintf("\nApplying KCL at node 1, \nI1 = %.3f",a);
    //When the 15 V source is acting alone
8 mprintf("\nApplying KCL at node 1, \nI1 = %.3f",b);
    //When the 10 V source is acting alone
9 mprintf("\nBy superposition theorem, \nI = I1+I2 = %
    .3f A",x);

```

Scilab code Exa 3.7 example7

```
1 //Network Theorem 2
2 //pg no 3.8
3 //example 3.7
4 a=3;
5 b=2;
6 x=a+b;
7 mprintf("\napplying KCL at node 1, \nIx1 = %.f A",a)
   ;//when the 30 V source is acting alone
8 mprintf("\napplying KCL at the mesh, \nIx2 = %.f A",
   b);//when the 20 V source is acting alone
9 mprintf("\nBy superposition theorem, Ix = Ix1+Ix2 =
   %.f A",x);
```

Scilab code Exa 3.8 example8

```
1 //Network Theorem 2
2 //pg no 3.10
3 //example 3.8
4 //when 5 V source is acting alone
5 disp("Vx+10I1=5");//equation 1
6 disp("Applying KVL to mesh,");
7 disp("4Vx+12I1=5");//equation 2
8 A=[1 10;4 12];//solving equation in matrix form
9 B=[5 5]';
10 X=inv(A)*B;
11 disp(X);
12 disp("I1 = 0.535 A");
13 //when the 2 A source is acting alone
14 disp("Vx+10I2=0");//equation 1
15 disp("Applying KCL at Node x,");
```

```

16 disp("Vx=-10/7"); //equation 2
17 A=[1 10;1 0]; //solving equation in matrix form
18 B=[0 -10/7]';
19 X=inv(A)*B;
20 disp(X);
21 disp("I2 = 0.1428 A");
22 a=0.535;
23 b=0.1428;
24 x=a+b;
25 printf("\nBy superposition theorem, \nI = I1+I2 = %
        .3f A ",x);

```

Scilab code Exa 3.9 example9

```

1 //Network Theorem 2
2 //pg no 3.10
3 //example 3.9
4 //when 100 V source is acting alone
5 disp("Vx-5I1=0"); //equation 1
6 disp("Applying KVL to mesh,");
7 disp("10Vx-15I1=-100"); //equation 2
8 A=[1 -5;10 -15]; //solving equation in matrix form
9 B=[0 -100]';
10 X=inv(A)*B;
11 disp(X); //negative because of opposite direction
12 disp("I1 = 2.857 A");
13 //when the 10 A source is acting alone
14 disp("9Vx+10I2=0"); //equation 1
15 disp("Applying KCL at Node 1,");
16 disp("Vx=-100/7"); //equation 2
17 A=[9 10;1 0]; //solving equation in matrix form
18 B=[0 -100/7]';
19 X=inv(A)*B;
20 disp(X);
21 disp("I2 = 12.857 A");

```

```

22 a=2.857;
23 b=12.857;
24 x=a+b;
25 printf("\nBy superposition theorem, \nI = I1+I2 = %
      .3f A ",x);

```

Scilab code Exa 3.10 example10

```

1 //Network Theorem 2
2 //pg no 3.11
3 //example 3.10
4 //when 17 V source is acting alone
5 disp("Vx+2I1=0");//equation 1
6 disp("Applying KVL to mesh,");
7 disp("-5Vx-5I1=17");//equation 2
8 A=[1 2;-5 -5];//solving equation in matrix form
9 B=[0 17] '
10 X=inv(A)*B;
11 disp(X);
12 disp("I1 = 3.4 A");
13 //when the 1 A source is acting alone
14 disp("4Vx+3I2=0");//equation 1
15 disp("Applying KCL at Node x,");
16 disp("Vx=-6/5");//equation 2
17 A=[4 3;1 0];//solving equation in matrix form
18 B=[0 -6/5] '
19 X=inv(A)*B;
20 disp(X);
21 disp("I2 = 1.6 A");
22 a=3.4;
23 b=1.6;
24 x=a+b;
25 printf("\nBy superposition theorem, \nI = I1+I2 = %.
      f A ",x);

```

Scilab code Exa 3.11 example11

```
1 //Network Theorem 2
2 //pg no 3.12
3 //example 3.11
4 //when 5 A source is acting alone
5 disp("-V1+4I=0");//equation 1
6 disp("Applying KCL to node 1,");
7 disp("1.25V1-4I=5");//equation 2
8 A=[-1 4;1.25 -4];//solving equation in matrix form
9 B=[0 5] '
10 X=inv(A)*B;
11 disp(X);
12 disp("V1 = 20 V");
13 //when the 20 V source is acting alone
14 disp("from the figure ,");
15 disp("V2-3I=0");//equation 1
16 disp("Applying KVL to the mesh,");
17 disp("I=-20");//equation 2
18 A=[1 -3;0 1];//solving equation in matrix form
19 B=[0 -20] '
20 X=inv(A)*B;
21 disp(X);
22 disp("V2 = -60 V");
23 a=20;
24 b=-60;
25 x=a+b;
26 mprintf("\nBy superposition theorem, \n V = V1+V2 =
    %.f V ",x);
```

Scilab code Exa 3.12 example12

```

1 //Network Theorem 2
2 //pg no 3.13
3 //example 3.12
4 //when 18 V source is acting alone
5 disp("Vx+I1=0");//equation 1
6 disp("Applying KVL to mesh,");
7 disp("3Vx-6I1=-18");//equation 2
8 A=[1 1;3 -6];//solving equation in matrix form
9 B=[0 -18]';
10 X=inv(A)*B;
11 disp(X);
12 disp("I1 = 2 A");
13 //when the 3 A source is acting alone
14 disp("from the figure,");
15 disp("Vx=2 V");//equation 1
16 disp("Applying KCL at node 1,");
17 disp("3Vx-6I2=0");//equation 2
18 A=[1 0;3 -6];//solving equation in matrix form
19 B=[2 0]';
20 X=inv(A)*B;
21 disp(X);
22 disp("I2 =1 V");
23 a=2;
24 b=1;
25 x=a+b;
26 mprintf("\nBy superposition theorem, \n I = I1+I2 =
    %.f A ",x);

```

Scilab code Exa 3.13 example13

```

1 //Network Theorem 2
2 //pg no 3.14
3 //example 3.13
4 //when 120 V source is acting alone
5 disp("Applying KVL to mesh,");

```



```

6 disp("Iy1=5.45 A");
7 //when the 12 A source is acting alone
8 disp("from the figure,");
9 disp("V1+4Iy2=0");//equation 1
10 disp("Applying KCL at node 1,");
11 disp("-V1/8 +9/4Iy2=-12");//equation 2
12 A=[1 4;-1/8 9/4];//solving equation in matrix form
13 B=[0 -12]'
14 X=inv(A)*B;
15 disp(X);
16 disp("Iy2 =-4.36 A");
17 //when 40 V source is acting alone
18 disp("Applying KVL to mesh,");
19 disp("Iy3=-1.82 A");
20 a=5.45;
21 b=-4.36;
22 c=-1.82;
23 x=a+b+c;
24 mprintf("\nBy superposition theorem, \n I = Iy1+Iy2+
    Iy3 = %.2f A ",x);

```

Scilab code Exa 3.14 example14

```

1 //Network Theorem 2
2 //pg no 3.15
3 //example 3.14
4 //when 18 V source is acting alone
5 disp("Vx1-3I=0");//equation 1
6 disp("Applying KVL to mesh,");
7 disp("-3Vx1-9I=-18");//equation 2
8 A=[1 -3;-3 -9];//solving equation in matrix form
9 B=[0 -18]'
10 X=inv(A)*B;
11 disp(X);
12 disp("Vx1 = 3 V");

```

```

13 //when the 5 A source is acting alone
14 disp("from the figure ,");
15 disp("V1+Vx2=0");//equation 1
16 disp("Applying KCL at node 1,");
17 disp("1/2V1-1/2Vx2=5");//equation 2
18 A=[1 1;1/2 -1/2];//solving equation in matrix form
19 B=[0 5]';
20 X=inv(A)*B;
21 disp(X);
22 disp("Vx2= -5 V");
23 //when the 36 V source is acting alone
24 disp("from the figure ,");
25 disp("Vx3+3I=0");//equation 1
26 disp("Applying KVL to the mesh,");
27 disp("3Vx3-9I=-36");//equation 2
28 A=[1 3;3 -9];//solving equation in matrix form
29 B=[0 -36]';
30 X=inv(A)*B;
31 disp(X);
32 disp("Vx3= -6 V");
33 a=3;
34 b=-5;
35 c=-6;
36 x=a+b+c;
37 mprintf("\nBy superposition theorem, \n Vx = Vx1+Vx2
+Vx3 = %.f V ",x);

```

Scilab code Exa 3.15 example15

```

1 //Network Theorem 2
2 //pg no 3.16
3 //example 3.15
4 a=10;
5 b=2;
6 c=(5*a)-(20*b);

```

```

7 x=20;
8 y=30;
9 z=5;
10 r=z+((x*y)/(x+y));
11 i=c/(r+c);
12 //Calculation of Vth(Thevenin's voltage)
13 disp("removing the 10 ohm resistor from the circuit"
    );
14 printf("\nFor mesh 1, \nI1 = %.f A",a);
15 printf("\nApplying KVL to mesh 2,, \nI2 = %.f A",b);
16 printf("\nWriting Vth equation, \n Vth = %.f V",c);
17 //Calculation of Rth(Thevenin's Resistance)
18 disp("replacing the current source of 10 A with an
    open circuit and voltage source of 100 V with a
    short circuit ,");
19 printf("\nRth = %.f Ohm",r);
20 //Calculation of IL(load current)
21 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.16 example16

```

1 //Network Theorem 2
2 //pg no 3.17
3 //example 3.16
4 a=30;
5 b=20;
6 c=50;
7 d=5;
8 e=24;
9 v=220;
10 x=(v/(a+c));
11 y=(v/(b+d));
12 z=(20*y)-(30*x);
13 r=((a*c)/(a+c))+((b*d)/(b+d));
14 i=z/(r+e);

```

```

15 // Calculation the Vth (Thevenin's voltage)
16 disp("removing the 24 Ohm resistor from the network"
    );
17 printf("\nI1 = %.2f A",x);
18 printf("\nI2 = %.1f A",y);
19 printf("\nWriting Vth equation , \n Vth = %.1f V",z);
20 // Calculation of Rth (Thevenin's resistance)
21 disp("replacing the 220 V source with short circuit"
    );
22 printf("\nRth = %.2f Ohm",r);
23 // Calculation of IL (load current)
24 printf("\nIL = %.f A",i);

```

Scilab code Exa 3.17 example17

```

1 //Network Theorem 2
2 //pg no 3.18
3 //example 3.17
4 disp("removing the 3 Ohm resistor from the network")
    ;
5 disp("Applying KVL to mesh 1");
6 disp("11*I1-9*I2=50");....//equation 1
7 disp("Applying KVL to mesh 2");
8 disp("-9*I1+18*I2=0");....//equation 2
9 A=[11 -9;-9 18];//solving the equations in matrix
    form
10 B=[50 0]';
11 X=inv(A)*B;
12 disp(X);
13 disp("I1=7.69 A");
14 disp("I2=3.85 A");
15 //Calculation of Vth (Thevenin's voltage)
16 a=7.69;
17 b=3.85;
18 v=-((5*b)+(8*(b-a)));//the B terminal is positive w.

```

```

    r.t A
19 printf("\nWriting Vth equation , \n Vth = %.1f V",v);
20 //Calculation of Rth (Thevenin's resistance)
21 x=4;
22 y=2;
23 z=5;
24 //delta into star network
25 r1=((x*y)/(x+y+z));
26 r2=((x*z)/(x+y+z));
27 r3=((z*y)/(x+y+z));
28 mprintf("\nR1 = %.2f Ohm \nR2 = %.2f Ohm \nR3 = %.2f
    Ohm",r1,r2,r3);
29 m=1.73;
30 n=8.91;
31 r=(r2+(m*n)/(m+n));
32 printf("\nRth = %.2f Ohm",r);
33 //Claculation of IL (Load Current)
34 i=v/(r+3);
35 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.18 example18

```

1 //Network Theorem 2
2 //pg no 3.21
3 //example 3.18
4 disp("removing the 20 Ohm resistor from the network"
    );
5 disp("Applying KVL to mesh 1");
6 disp("30*I1-15*I2=-75");....//equation 1
7 disp("Applying KVL to mesh 2");
8 disp("-15*I1+20*I2=20");....//equation 2
9 A=[30 -15;-15 20];//solving the equations in matrix
    form
10 B=[-75 20]';
11 X=inv(A)*B;

```

```

12 disp(X);
13 disp(" I1=-3.2 A");
14 disp(" I2=-1.4 A");
15 //Calculation of Vth (Thevenin's voltage)
16 a=-3.2;
17 b=-1.4;
18 v=45;
19 v1=45-10*(a-b);
20 printf("\nWriting Vth equation, \n Vth = %.f V",v1);
21 //Calculation of Rth (Thevenin's resistance)
22 x=10;
23 y=5;
24 z=5;
25 //delta into star network
26 r1=((x*y)/(x+y+z));
27 r2=((x*z)/(x+y+z));
28 r3=((z*y)/(x+y+z));
29 mprintf("\nR1 = %.1 f Ohm \nR2 = %.1 f Ohm \nR3 = %.1 f
      Ohm",r1,r2,r3);
30 m=16.25;
31 r=((m*r1)/(m+r1))+r1;
32 printf("\nRth = %.2 f Ohm",r);
33 //Claculation of IL (Load Current)
34 i=v1/(r+20);
35 printf("\nIL = %.2 f A",i);

```

Scilab code Exa 3.19 example19

```

1 //Network Theorem 2
2 //pg no 3.22
3 //example 3.19
4 disp("removing the 3 Ohm resistor from the network")
  ;
5 disp("Applying KVL to mesh 1");
6 disp(" I1=6");....//equation 1

```

```

7 disp("Applying KVL to mesh 2");
8 disp("-12*I1+18*I2=42");....//equation 2
9 A=[1 0;-12 18];//solving the equations in matrix
  form
10 B=[6 42]';
11 X=inv(A)*B;
12 disp(X);
13 disp("I2= 6.33 A");
14 //Calculation of Vth (Thevenin's voltage)
15 a=6.33;
16 v=6*a;
17 printf("\nWriting Vth equation, \n Vth = %.f V",v);
18 //Calculation of Rth (Thevenin's resistance)
19 disp("replacing the voltage source with short
  circuit and current source by open circuit");
20 x=6;
21 y=12;
22 r=(x*y)/(x+y);
23 printf("\nRth = %.f Ohm",r);
24 //Calculation of IL (load current)
25 i=v/(r+3);
26 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.20 example20

```

1 //Network Theorem 2
2 //pg no 3.23
3 //example 3.20
4 disp("removing the 30 Ohm resistor from the network"
  );
5 disp("Applying KVL to supermesh ");
6 disp("-I1+I2=13");....//equation 1
7 disp("15*I1+100*I2=150");....//equation 2
8 //Calculation of Vth (Thevenin's voltage)
9 a=3;

```

```

10 v=(40*a)-50;
11 printf("\nWriting Vth equation , \n Vth = %.f V",v);
12 // Calculation of Rth (Thevenin's resistance)
13 disp("replacing the voltage source with short
      circuit and current source by open circuit");
14 r=(75*40)/(75+40);
15 printf("\nRth = %.2f Ohm",r);
16 // Calculation of IL (load current)
17 i=v/(r+30);
18 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.21 example21

```

1 //Network Theorem 2
2 //pg no 3.25
3 //example 3.21
4 // Calculation of Vth
5 v=100;
6 r=20;
7 x=v/r;
8 disp("Removing the 20 Ohm resistor from the network"
      );
9 printf("\nVth = %.f V ",v);
10 // calculation of Rth
11 disp("replacing the voltage source with short
      circuit and current source by open circuit");
12 disp("Rth = 0");
13 // calculation of IL
14 printf("\nIL = %.f A",x);

```

Scilab code Exa 3.22 example22

```

1 //Network Theorem 2

```



```

2 //pg no 3.25
3 //example 3.22
4 disp("removing the 10 Ohm resistor from the network"
      );
5 disp("Applying KVL to mesh 1");
6 disp("4*I1-I2=-25");....//equation 1
7 disp("Applying KVL to mesh 2");
8 disp("-I1+4*I2=10");....//equation 2
9 A=[4 -1;-1 4];//solving the equations in matrix form
10 B=[-25 10]';
11 X=inv(A)*B;
12 disp(X);
13 disp("I1=-6 A");
14 disp("I2=1 A");
15 //Calculation of Vth (Thevenin's voltage)
16 a=-6;
17 b=1;
18 v=-((2*a)+(2*b));//the terminal B is positive w.r.t
    A
19 printf("\nWriting Vth equation , \n Vth = %.f V",v);
20 //Calculation of Rth (Thevenin's resistance)
21 x=2;
22 y=2;
23 z=1;
24 //star into delta network
25 r1=x+y+((x*y)/z);
26 r2=x+z+((x*z)/y);
27 r3=z+y+((z*y)/x);
28 mprintf("\nR1 = %.f Ohm \nR2 = %.f Ohm \nR3 = %.f
    Ohm",r1,r2,r3);
29 //Claculation of IL (Load Current)
30 r=1.33;
31 i=v/(r+v);
32 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.23 example23

```
1 //Network Theorem 2
2 //pg no 3.28
3 //example 3.23
4 disp("removing the 1 Ohm resistor from the network")
5 ;
6 disp("writing current equation for meshes 1 & 2 ");
7 disp("I1= -3 A");....//equation 1
8 disp("I2=1 A");....//equation 2
9 //Calculation of Vth (Thevenin's voltage)
10 a=-3;
11 b=1;
12 r=2;
13 v=4-2*(a-b);
14 printf("\nWriting Vth equation , \n Vth = %.f V",v);
15 //Calculation of Rth (Thevenin's resistance)
16 disp("replacing the voltage source with short
17 circuit and current source by open circuit");
18 disp("Rth = 2 Ohm");
19 //Calculation of IL (load current)
20 i=v/(r+1);
21 printf("\nIL = %.f A",i);
```

Scilab code Exa 3.24 example24

```
1 //Network Theorem 1
2 //page no-3.29
3 //example3.24
4 //calculation of Isc (short-circuit current)
5 disp("Applying KVL to mesh 1:");
6 disp("I1=2");....//equation 1
7 disp("Writing current equation to supermesh:");//
8 meshes 2 & 3 will form a supermesh
9 disp("I3-I2=4");....//equation 2
```

```

9 disp("Applying KVL to supermesh:");
10 disp("-5I2 -15I3=0");....//equation 3
11 disp("solving these equations we get :");...//
    solving equations in matrix form
12 A=[1 0 0;0 -1 1;0 -5 -15];
13 B=[2 4 0]';
14 X=inv(A)*B;
15 disp(X);
16 disp("I1 = 2 A");
17 disp("I2 = -3 A");
18 disp("I3 = 1 A");
19 a=2;
20 b=-3;
21 x=a-b;
22 printf("\nIsc = %.f A",x);
23 //calculation of Rn (norton's resistance)
24 disp("replacing the voltage source with short
    circuit and current source by open circuit");
25 c=1;
26 m=15;
27 y=(c*(m+x))/(c+m+x);
28 printf("\nRn = %.2f Ohm",y);
29 //calculation of IL (load current)
30 z=10;
31 i=x*(y/(z+y));
32 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.25 example25

```

1 //Network Theorem 1
2 //page no-3.30
3 //example3.25
4 //calculation of Isc (short-circuit current)
5 disp("Applying KVL to mesh 1:");
6 disp("7*I1 -2*I2=20");....//equation 1

```

```

7 disp("Applying KVL to mesh 2,");
8 disp("-2*I1+10*I2=-12");....//equation 2
9 disp("solving these equations we get :");...//
    solving equations in matrix form
10 A=[7 -2;-2 10];
11 B=[20 -12]';
12 X=inv(A)*B;
13 disp(X);
14 disp("I2 = -0.67 A");
15 a=-0.67;
16 printf("\nIsc = I2 = %.2f A",a);
17 //calculation of Rn (norton's resistance)
18 disp("replacing the voltage source with short
    circuit ");
19 b=5;
20 c=2;
21 d=8;
22 y=((b*c)/(b+c))+d;
23 printf("\nRn = %.2f Ohm",y);
24 //calculation of IL (load current)
25 z=10;
26 i=-a*(y/(10+y));
27 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.26 example26

```

1 //Network Theorem 1
2 //page no-3.31
3 //example3.26
4 //calculation of Isc (short-circuit current)
5 disp("Applying KVL to mesh 1:");
6 disp("7*I1-I2=10");....//equation 1
7 disp("Applying KVL to mesh 2:");
8 disp("-I1+6*I2-3*I3=0");....//equation 2
9 disp("Applying KVL to mesh 3:");

```

```

10 disp("3*I2-3*I3=20");....//equation 3
11 disp("solving these equations we get :");...//
    solving equations in matrix form
12 A=[7 -1 0;-1 6 -3;0 3 -3];
13 B=[10 0 20]';
14 X=inv(A)*B;
15 disp(X);
16 disp("I1 = -13.17 A");
17 a=13.17;
18 printf("\nIsc = %.2f A",a);
19 //calculation of Rn (norton's resistance)
20 disp("replacing the voltage source with short
    circuit ");
21 c=1;
22 b=6;
23 x=(c*b)/(c+b);
24 y=x+2;
25 z=(y*3)/(y+3);
26 printf("\nRn = %.2f Ohm",z);
27 //calculation of IL (load current)
28 n=10;
29 i=a*(z/(z+n));
30 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.27 example27

```

1 //Network Theorem 1
2 //page no-3.32
3 //example3.27
4 //calculation of Isc (short-circuit current)
5 disp("Applying KVL to mesh 1:");
6 disp("20*I1-20*I2=10");....//equation 1
7 disp("Applying KVL to mesh 2:");
8 disp("-20*I1+60*I2-20*I3=40");....//equation 2
9 disp("Applying KVL to mesh 3:");

```

```

10 disp("-20*I2+50*I3=-100");....//equation 3
11 disp("solving these equations we get :");...//
    solving equations in matrix form
12 A=[20 -20 0;-20 60 -20;0 -20 50];
13 B=[10 40 -100]';
14 X=inv(A)*B;
15 disp(X);
16 disp("I1 = 0.81A");
17 a=0.81;
18 printf("\nIsc = %.2 f A",a);
19 //calculation of Rn (norton's resistance)
20 disp("replacing the voltage source with short
    circuit ");
21 c=20;
22 b=30;
23 x=(c*b)/(c+b);
24 y=x+c;
25 z=(y*c)/(y+c);
26 printf("\nRn = %.1 f Ohm",z);
27 //calculation of IL (load current)
28 n=10;
29 i=a*(z/(z+n));
30 printf("\nIL = %.2 f A",i);

```

Scilab code Exa 3.28 example28

```

1 //Network Theorem 1
2 //page no-3.33
3 //example3.28
4 //calculation of Isc (short-circuit current)
5 disp("Applying KVL to mesh 1:");
6 disp("90*I1-60*I2=120");....//equation 1
7 disp("Applying KVL to mesh 2:");
8 disp("-60*I1+100*I2-30*I3=40");....//equation 2
9 disp("Applying KVL to mesh 3:");

```

```

10 disp("30*I2-30*I3=-10");....//equation 3
11 disp("solving these equations we get :");...//
    solving equations in matrix form
12 A=[90 -60 0;-60 100 -30;0 30 -30];
13 B=[120 40 -10]';
14 X=inv(A)*B;
15 disp(X);
16 disp("I3 = 4.67A");
17 a=4.67;
18 printf("\nIsc = %.2f A",a);
19 //calculation of Rn (norton's resistance)
20 disp("replacing the voltage source with short
    circuit ");
21 c=30;
22 b=60;
23 x=(c*b)/(c+b);
24 y=x+10;
25 z=(y*c)/(y+c);
26 printf("\nRn = %.f Ohm",z);

```

Scilab code Exa 3.29 example29

```

1 //Network Theorem 1
2 //page no-3.34
3 //example3.29
4 //calculation of Isc (short-circuit current)
5 disp("Writing current equation for supermesh :");
6 disp("I2-I1=2");....//equation 1
7 disp("Applying KVL to supermesh ,");
8 disp("12*I1= 55");....//equation 2
9 disp("solving these equations we get :");...//
    solving equations in matrix form
10 A=[-1 1;12 0];
11 B=[2 55]';
12 X=inv(A)*B;

```

```

13 disp(X);
14 disp(" I1 = 4.58 A");
15 disp(" I2 = 6.58 A");
16 a=6.58;
17 printf("\nIsc = I2 = %.2f A",a);
18 //calculation of Rn (norton's resistance)
19 disp("replacing the voltage source with short
      circuit and current source with open circuit ");
20 b=12;
21 c=4;
22 y=((b*c)/(b+c));
23 printf("\nRn = %.f Ohm",y);
24 //calculation of IL (load current)
25 z=8;
26 i=a*(y/(z+y));
27 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.30 example30

```

1 //Network Theorem 1
2 //page no-3.35
3 //example3.30
4 //calculation of Isc (short-circuit current)
5 disp("Applying KVL to mesh 1:");
6 disp("5*I1 -2*I2=-2");....//equation 1
7 disp("Applying KVL to mesh 2:");
8 disp("4*I2 -2*I3=-1");....//equation 2
9 disp("Applying KVL to mesh 3:");
10 disp("-2*I1 -2*I2 +4*I3=0");....//equation 3
11 disp("solving these equations we get :");...//
    solving equations in matrix form
12 A=[5 -2 0;0 4 -2 ;-2 -2 4];
13 B=[-2 -1 0]';
14 X=inv(A)*B;
15 disp(X);

```



```

16 disp(" I1 = -0.64A");
17 disp(" I2 = -0.55A");
18 disp(" I3 = -0.59A");
19 a=-0.64;
20 b=-0.55;
21 c=-0.59;
22 printf("\nIsc = I3 = %.2f A",a);
23 //calculation of Rn (norton's resistance)
24 disp("replacing the voltage source with short
      circuit ");
25 z=2.2;
26 printf("\nRn = %.1f Ohm",z);
27 //calculation of IL (load current)
28 n=1;
29 i=-c*(z/(z+n));
30 printf("\nIL = %.2f A",i);

```

Scilab code Exa 3.31 example31

```

1 //Network Theorem 1
2 //page no-3.39
3 //example3.31
4 //calculation of Vth (Thevenin's voltage)
5 a=0.25;
6 v=(10*a)+(8*a);
7 disp("Writing Vth equation,");
8 printf("\nVth = %.f V",v);
9 //calculation of Isc (short-circuit current)
10 disp("Applying KVL to mesh 1:");
11 disp("4*I1-2*I2 = 1");....//equation 1
12 disp("Applying KVL to mesh 2:");
13 disp("-18*I1-11*I2=0");....//equation 2
14 A=[4 -2;18 -11];
15 B=[1 0]';
16 X=inv(A)*B;

```

```

17 disp(X);
18 disp(" I2 = 2.25 A");
19 a=2.25;
20 printf("\nIsc = I2 = %.2 f A",a);
21 //Calculation of Rth
22 x=v/a;
23 printf("\nRth = %. f Ohm",x);

```

Scilab code Exa 3.33 example33

```

1 //Network Theorem 1
2 //page no-3.39
3 //example3.33
4 //calculation of Vth (Thevenin's voltage)
5 a=0.25;
6 v=(10*a)+(8*a);
7 disp("Writing Vth equation,");
8 printf("\nVth = %. f V",v);
9 //calculation of Isc (short-circuit current)
10 disp("Applying KVL to mesh 1:");
11 disp("4*I1-2*I2 = 1");....//equation 1
12 disp("Applying KVL to mesh 2:");
13 disp("-18*I1-11*I2=0");....//equation 2
14 A=[4 -2;18 -11];
15 B=[1 0]';
16 X=inv(A)*B;
17 disp(X);
18 disp(" I2 = 2.25 A");
19 a=2.25;
20 printf("\nIsc = I2 = %.2 f A",a);
21 //Calculation of Rth
22 x=v/a;
23 printf("\nRth = %. f Ohm",x);

```

Scilab code Exa 3.41 example41

```
1 //Network Theorem 1
2 //page no-3.47
3 //example3.41
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
      network:");
6 disp("I2-I1=4");....//equation 1
7 disp("Applying KVL at the outerpath:");
8 disp("-6*I1-5*I2=2");....//equation 2
9 A=[-1 1;-6 -5];
10 B=[4 2]';
11 X=inv(A)*B;
12 disp(X);
13 disp("I1 = -2 A");
14 disp("I2 = 2 A");
15 disp("Writing Vth equation,");
16 a=-2;
17 v=8-a;
18 printf("\nVth = %.f V",v);
19 //calculation of Rth
20 disp("replacing the voltage source with short
      circuit and current source by an open circuit ");
21 x=(v*1)/(v+1);
22 printf("\nRth = %.2f Ohm",x);
23 //calculation of RL
24 disp("For maximum power transfer");
25 printf("\nRth = RL =%.2f Ohm",x);
26 //calculation of Pmax
27 m=(v^2)/(4*x);
28 printf("\nPmax = %.2f W",m);
```

Scilab code Exa 3.42 example42

```
1 //Network Theorem 1
2 //page no-3.48
3 //example3.42
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
      network:");
6 disp("I1=50");....//equation 1
7 disp("Applying KVL to mesh 2:");
8 disp("5*I1-10*I2=0");....//equation 2
9 A=[1 0;5 -10];
10 B=[50 0]';
11 X=inv(A)*B;
12 disp(X);
13 disp("I2 = 25 A");
14 disp("Writing Vth equation,");
15 a=25;
16 v=3*a;
17 printf("\nVth = %.f V",v);
18 //calculation of Rth
19 disp("replacing the current source of 50 A by an
      open circuit ");
20 x=7;
21 y=3;
22 m=(x*y)/(x+y);
23 printf("\nRth = %.1f Ohm",m);
24 //calculation of RL
25 disp("For maximum power transfer");
26 printf("\nRth = RL =%.1f Ohm",m);
27 //calculation of Pmax
28 n=(v^2)/(4*m);
29 printf("\nPmax = %.2f W",n);
```

Scilab code Exa 3.43 example43

```
1 //Network Theorem 1
2 //page no-3.49
3 //example3.43
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
      network:");
6 disp("Writing the current equation for the supermesh
      ");
7 disp("I2-I1=6");....//equation 1
8 disp("Applying KVL to the supermesh :");
9 disp("5*I1+2*I2=10");....//equation 2
10 A=[-1 1;5 1];
11 B=[6 10]';
12 X=inv(A)*B;
13 disp(X);
14 disp("I1 = -0.29 A");
15 disp("I2 = 5.71 A");
16 disp("Writing Vth equation,");
17 a=5.71;
18 v=2*a;
19 printf("\nVth = %.f V",v);
20 //calculation of Rth
21 disp("replacing the current source of 50 A by an
      open circuit ");
22 x=5;
23 y=2;
24 m=((x*y)/(x+y))+3+4;
25 printf("\nRth = %.2f Ohm",m);
26 //calculation of RL
27 disp("For maximum power transfer");
28 printf("\nRth = RL =%.2f Ohm",m);
29 //calculation of Pmax
```

```

30 n=(v^2)/(4*m);
31 printf("\nPmax = %.2 f W",n);

```

Scilab code Exa 3.44 example44

```

1 //Network Theorem 1
2 //page no-3.50
3 //example3.44
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
   network:");
6 disp("Applying KVL to mesh 1");
7 disp("15*I1-5*I2=120");....//equation 1
8 disp("Applying KVL to the mesh 2:");
9 disp("I2=-6");....//equation 2
10 A=[15 -5;0 1];
11 B=[120 -6]';
12 X=inv(A)*B;
13 disp(X);
14 disp("I1 = 6 A");
15 disp("Writing Vth equation,");
16 a=6;
17 v=120-(10*a);
18 printf("\nVth = %.f V",v);
19 //calculation of Rth
20 disp("replacing the current source of 50 A by an
   open circuit ");
21 x=10;
22 y=5;
23 m=((x*y)/(x+y));
24 printf("\nRth = %.2 f Ohm",m);
25 //calculation of RL
26 disp("For maximum power transfer");
27 printf("\nRth = RL =%.2 f Ohm",m);
28 //calculation of Pmax

```

```

29 n=(v^2)/(4*m);
30 printf("\nPmax = %.2 f W",n);

```

Scilab code Exa 3.45 example45

```

1 //Network Theorem 1
2 //page no-3.51
3 //example3.45
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
   network:");
6 disp(" I1=3 A");....//equation 1
7 disp(" Applying KVL to the mesh 2:");
8 disp("-25*I1+41*I2=0");....//equation 2
9 A=[1 0;-25 41];
10 B=[3 0]';
11 X=inv(A)*B;
12 disp(X);
13 disp(" I2 = 1.83 A");
14 disp(" Writing Vth equation ,");
15 a=1.83;
16 v=-20+(10*a)+(6*a);
17 printf("\nVth = %.2 f V",v);
18 //calculation of Rth
19 disp("replacing the current source of 50 A by an
   open circuit ");
20 x=25;
21 y=16;
22 m=((x*y)/(x+y));
23 printf("\nRth = %.2 f Ohm",m);
24 //calculation of RL
25 disp(" For maximum power transfer");
26 printf("\nRth = RL =%.2 f Ohm",m);
27 //calculation of Pmax
28 n=(v^2)/(4*m);

```

```
29 printf("\nPmax = %.2 f W",n);
```

Scilab code Exa 3.46 example46

```
1 //Network Theorem 1
2 //page no-3.52
3 //example3.46
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
   network:");
6 disp("I2-I1=2");....//equation 1
7 disp("I2=-3 A");....//equation 2
8 A=[-1 1;0 1];
9 B=[2 -3]';
10 X=inv(A)*B;
11 disp(X);
12 disp("I1 = -5 A");
13 disp("Writing Vth equation,");
14 a=-5;
15 b=-3;
16 v=8-(2*a)-b-6;
17 printf("\nVth = %.f V",v);
18 //calculation of Rth
19 disp("replacing the voltage source with short
   circuit and current source by an open circuit ");
20 m=5;
21 printf("\nRth = %.f Ohm",m);
22 //calculation of RL
23 disp("For maximum power transfer");
24 printf("\nRth = RL =%.f Ohm",m);
25 //calculation of Pmax
26 n=(v^2)/(4*m);
27 printf("\nPmax = %.2 f W",n);
```

Scilab code Exa 3.47 example47

```
1 //Network Theorem 1
2 //page no-3.52
3 //example3.46
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
      network:");
6 disp("By star-delta transformation");
7 a=5;
8 b=20;
9 c=9;
10 v=100;
11 i=v/(a+a+b+c+c);
12 disp("Writing Vth equation ,");
13 vth=v-(14*i);
14 printf("\nVth = %.2 f V",vth);
15 //calculation of Rth
16 disp("replacing the voltage source with short
      circuit ");
17 m=23.92;
18 printf("\nRth = %.2 f Ohm",m);
19 //calculation of RL
20 disp("For maximum power transfer");
21 printf("\nRth = RL =%.2 f Ohm",m);
22 //calculation of Pmax
23 n=(vth^2)/(4*m);
24 printf("\nPmax = %.2 f W",n);
```

Scilab code Exa 3.48 example48

```
1 //Network Theorem 1
```

```

2 //page no-3.55
3 //example3.48
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
   network:");
6 disp("Applying KVL to the mesh 1:");
7 disp("35*I1-30*I2=60");....//equation 1
8 disp("Applying KVL to the mesh 2:");
9 disp("I2=2");....//equation 2
10 A=[35 -30;0 1];
11 B=[60 2]';
12 X=inv(A)*B;
13 disp(X);
14 disp("I1 = 3.43 A");
15 disp("Writing Vth equation,");
16 a=3.43;
17 b=2;
18 v=20*(a-b)+20;
19 printf("\nVth = %.2f V",v);
20 //calculation of Rth
21 disp("replacing the voltage source with short
   circuit and current source by an open circuit ");
22 x=15;
23 y=20;
24 m=((x*y)/(x+y));
25 printf("\nRth = %.2f Ohm",m);
26 //calculation of RL
27 disp("For maximum power transfer");
28 printf("\nRth = RL =%.2f Ohm",m);
29 //calculation of Pmax
30 n=(v^2)/(4*m);
31 printf("\nPmax = %.1f W",n);

```

Scilab code Exa 3.49 example49

```

1 //Network Theorem 1
2 //page no-3.56
3 //example3.49
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
      network:");
6 x=100;
7 a=10;
8 b=20;
9 c=30;
10 d=40;
11 i1=x/(a+c);
12 i2=x/(b+d);
13 printf("\ni1 = %.1f A",i1);
14 printf("\ni2 = %.2f A",i2);
15 disp("Writing Vth equation,");
16 x=2.5;
17 y=1.66;
18 v=(20*y)-(10*x);
19 printf("\nVth = %.1f V",v);
20 //calculation of Rth
21 disp("replacing the voltage source of 100V with
      short circuit ");
22 m=((a*c)/(a+c))+((b*d)/(b+d));
23 printf("\nRth = %.2f Ohm",m);
24 //calculation of RL
25 disp("For maximum power transfer");
26 printf("\nRth = RL =%.2f Ohm",m);
27 //calculation of Pmax
28 n=(v^2)/(4*m);
29 printf("\nPmax = %.2f W",n);

```

Scilab code Exa 3.50 example50

```

1 //Network Theorem 1

```

```

2 //page no-3.57
3 //example3.50
4 //calculation of Vth
5 disp("Removing the variable resistor RL from the
    network:");
6 disp("Applying KVL to the mesh 1:");
7 disp("9*I1-3*I2=72");....//equation 1
8 disp("Applying KVL to the mesh 2:");
9 disp("-3*I1+9*I2=0");....//equation 2
10 A=[9 -3;-3 9];
11 B=[72 0]';
12 X=inv(A)*B;
13 disp(X);
14 disp("I1 = 9 A");
15 disp("I2 = 3 A");
16 disp("Writing Vth equation,");
17 a=9;
18 b=3;
19 v=(6*a)+(2*b);
20 printf("\nVth = %.f V",v);
21 //calculation of Rth
22 disp("replacing the voltage source with short
    circuit and current source by an open circuit ");
23 x=6;
24 y=2;
25 z=4;
26 m=((x*b)/(x+b))+2;
27 l=((m*z)/(m+z));
28 printf("\nRth = %.f Ohm",l);
29 //calculation of RL
30 disp("For maximum power transfer");
31 printf("\nRth = RL =%.f Ohm",l);
32 //calculation of Pmax
33 n=(v^2)/(4*l);
34 printf("\nPmax = %.f W",n);

```

Scilab code Exa 3.51 example51

```
1 //Network Theorem 1
2 //page no-3.58
3 //example3.51
4 //Calculation of Vth
5 disp("from the figure");
6 disp("Vth=4*I");
7 disp("Applying KVL to the mesh");
8 disp("0.5*Vth-8*I=-12");
9 A=[1 -4;0.5 -8];
10 B=[0 -12]';
11 X=inv(A)*B;
12 disp(X);
13 disp("Vth=8 V");
14 //Calculation of Isc
15 v=8;
16 i=12/4;
17 printf("\nIsc = %.f A",i);
18 //Calculation of Rth
19 r=v/i;
20 printf("\nRth = Vth/Isc = %.3f Ohm",r);
21 //calculation of RL
22 disp("For maximum power transfer");
23 printf("\nRth = RL =%.3f Ohm",r);
24 //calculation of Pmax
25 x=v/(2*r);
26 printf("\nIL = %.1f A",x);
27 n=(x^2)*r;
28 printf("\nPmax = %.f W",n);
```

Chapter 4

AC Circuits

Scilab code Exa 4.1 example1

```
1 //AC Circuits:example 4.1:(pg4.4)
2 i=15;
3 t=3.375*10^-3;
4 f=40;
5 pi=3.14;
6 Im=(i/sin(2*pi*f*t));
7 disp(" i=15 Amp");
8 disp(" t=3.375 ms");
9 disp(" f=40 Hz");
10 disp(" i=Im*sin(2*pi*f*t)");
11 printf("Im=%fAmp", Im);
```

Scilab code Exa 4.2 example2

```
1 //AC Circuits:example 4.2:(pg4.4)
2 f=50;
3 Im=100;
4 i1=86.6;
```

```

5 t=(1/600);
6 pi=3.14;
7 disp(" f=50 c/s");
8 disp(" Im=100 A");
9 // part(a)
10 disp(" i=Im*sin(2*pi*f*t)");
11 i=Im*sin(2*pi*f*t);
12 printf(" i=%f A",i);
13 // part (b)
14 disp(" i=Im*sin(2*pi*f*t1)");
15 t1=(asind(i1/Im)/(2*pi*f));
16 printf(" t1=%e second",t1);

```

Scilab code Exa 4.3 example3

```

1 //AC Circuits:example 4.3:(pg4.5)
2 f=50;
3 I=20;
4 t1=0.0025;
5 t2=0.0125;
6 I1=14.14;
7 pi=3.14;
8 disp(" f=50 c/s");
9 disp(" I=20 A");
10 mprintf(" Im=I*sqrt(2)");
11 Im=(sqrt(2)*I);
12 printf("\nIm=%f A",Im);
13 mprintf("\nEquation of current, \ni=Im*sin(2*pi*f*t)");
14 disp(" =28.28 sin(2*pi*f*t)=28.28 sin(100*pi*t)");
15 disp(" (a)At t=0.0025 seconds");
16 i=(Im*sin(2*pi*f*t1));
17 printf(" i=%f A",i); //when t=0.0025 seconds
18 disp(" (b)At t=0.0125 seconds");
19 i=(Im*sin(2*pi*f*t2));

```

```

20 printf(" i=%f A",i); //when t=0.0125 seconds
21 disp(" (c) i=28.28 sin(100*pi*t) ");
22 t=(asind(I1/Im)/(2*pi*f));
23 printf(" t=%e second",t);// when I=14.14A

```

Scilab code Exa 4.4 example4

```

1 //AC Circuits : example 4.4 :pg(4.5)
2 pi=3.14;
3 Vm=200;
4 disp(" v=200 sin314t ");
5 disp(" v=Vmsin(2*pi*f*t) ");
6 disp(" (2*pi*f)=314 ");
7 f=(314/(2*pi));
8 printf(" f=%f Hz",f);
9 Vavg=((2*Vm)/pi);
10 Vrms=(Vm/sqrt(2));
11 mprintf('\nFor a sinusoidal waveform, \nVavg=(2*Vm/\npi) \nVrms=(Vm/sqrt(2)) ');
12 kf=(Vrms/Vavg);
13 kc=(Vm/Vrms);
14 mprintf('\nform fator=%f',kf);
15 mprintf('\ncrest factor=%f',kc);

```

Scilab code Exa 4.5 example5

```

1 //AC Circuits : example 4.5 :(pg 4.6)
2 kf=1.2;
3 kp=1.5;
4 Vavg=10;
5 disp(" kf=1.2 ");
6 disp(" kp=1.5 ");
7 disp(" Vavg=10 ");

```



```

8 disp("form factor kf=(Vrms/Vavg)");
9 Vrms=(kf*Vavg);
10 printf("\nVrms=%0. f V",Vrms);
11 disp("peak factor kp=(Vm/Vrms)");
12 Vm=(kp*Vrms);
13 printf("\nVm=%0. f V",Vm);

```

Scilab code Exa 4.14 example14

```

1 //AC Circuits: example 4.14 :(pg 4.11)
2 v1=0;
3 v2=40;
4 v3=60;
5 v4=80;
6 v5=100;
7 t=8;
8 Vavg=((v1+v2+v3+v4+v5+v4+v3+v2)/t);
9 Vrms=sqrt((v1^2+v2^2+v3^2+v4^2+v5^2+v4^2+v3^2+v2^2)/
t);
10 disp("Vavg=((0+40+60+80+100+80+60+40)/8)");
11 printf("\nVavg=%0.1 f V",Vavg);
12 disp("Vrms=sqrt((0+(40)^2+(60)^2+(80)^2+(100)^2+(80)
^2+(60)^2+(40)^2)/8)");
13 printf("\nVrms=%0.2 f V",Vrms);

```

Scilab code Exa 4.15 example15

```

1 //AC Circuits : example 4.15 :pg(4.11 & 4.12)
2 v1=0;
3 v2=10;
4 v3=20;
5 t=3;
6 Vavg=((v1+v2+v3)/t);

```

```

7 Vrms=(sqrt((v1^2+v2^2+v3^2)/t));
8 disp("Vavg=((0+10+20)/3)");
9 printf("Vavg=%0.1 f V",Vavg);
10 disp("Vrms=((0)^2+(10)^2+(20)^2)/3)");
11 printf("Vrms=%0.1 f V",Vrms);

```

Scilab code Exa 4.33 example33

```

1 //AC Circuits : example 4.33 :pg(4.27)
2 Vm=177;
3 Im=14.14;
4 phi=30;
5 V=(Vm/sqrt(2));
6 I=(Im/sqrt(2));
7 pf=cosd(30);
8 P=(V*I*pf);
9 disp("v(t)=177 sin(314t+10)"); // value of 10 is in
   degrees
10 disp("i(t)=14.14 sin(314t-20)"); //value of 20 is in
   degrees
11 mprintf("\nCurrent i(t) lags behind voltage v(t) by
   30 degrees");
12 disp("phi=30 degrees");
13 printf("Power factor          pf=cos(30)=%0.3 f (lagging)
   ",pf);
14 printf("\nPower consumed      P=V*I*cos(phi)=%0.1 f W",P
   );

```

Scilab code Exa 4.42 example42

```

1 //AC Circuits : example 4.42 :pg(4.32 & 4.33)
2 PR=1000;
3 VR=200;

```

```

4 Pcoil=250;
5 Vcoil=300;
6 R=((VR^2)/PR);
7 I=(VR/R);
8 r=((Pcoil/(I^2)));
9 Zcoil=(Vcoil/I);
10 XL=sqrt((Zcoil^2)-(r^2));
11 RT=(R+r);
12 ZT=sqrt((RT^2)+(XL^2));
13 V=(ZT*I);
14 printf("\nPR=1000 W \nVR=200 V \nPcoil=250 W \nVcoil
    =300 V \nPR=(VR^2/R)");
15 printf("\nR=%f Ohms",R);
16 printf("\nVR=R*I \nI=%f A",I);
17 disp("Pcoil=(I^2)*r");
18 printf("\nResistance of coil      r=%f Ohm",r);
19 printf("\nImpedance of coil      Zcoil=(Vcoil/I)=%f
    f Ohms",Zcoil);
20 printf("\nReactance of coil      XL=sqrt((Zcoil^2
    -(r^2))=%f Ohms",XL);
21 printf("\nCombined resistance    RT=R+r=%f Ohms",
    RT);
22 printf("\nCombined impedance     ZT=sqrt(((R+r)^2
    +(XL^2))=%f Ohms",ZT);
23 printf("\nSupply voltage         V=ZT*I=%f V",V);

```

Scilab code Exa 4.47 example47

```

1 //AC Circuits : example 4.47 :pg(4.47)
2 f1=60;
3 V=200;
4 P=600;
5 I=5;
6 f=50;
7 Z=V/I;

```

```

8 r=(P/(I^2));
9 XL=sqrt((Z^2)-(r^2));
10 L=(XL/(2*pi*f));
11 XL1=(2*pi*f*L);
12 Z1=sqrt((r^2)+(XL1^2));
13 I=(V/Z1);
14 printf("\nI=5 A \nV=200 V \nP=600 W \nFor f=50 Hz,")
    ;
15 printf("\nZ=V/I =%.1 f Ohms",Z);
16 printf("\nP=((I^2)*r) \nr=%.1 f Ohms",r);
17 printf("\nXL=sqrt((Z^2)-(r^2)) \nXL=%.1 f Ohms",XL);
18 printf("\nXL=(2*pi*f*L) \nL=%.1 f H",L);
19 printf("\nFor f=60 Hz \nXL=%.1 f Ohm",XL1);
20 printf("\nr=24 Ohms \nZ=sqrt((r^2)+(XL^2))=%.2 f Ohms
    ",Z1);
21 printf("\nI=V/Z=%.3 f A",I);

```

Scilab code Exa 4.48 example48

```

1 //AC Circuits : example 4.48 :(pg 4.37)
2 f=50;
3 pi=3.14;
4 Vdc=12;
5 Idc=2.5;
6 Vac=230;
7 Iac=2;
8 Pac=50;
9 R=(Vdc/Idc);
10 Z=(Vac/Iac);
11 Pi=(Pac-((Iac^2)*R));
12 RT=(Pac/(Iac^2));
13 XL=sqrt((Z^2)-(RT^2));
14 L=(XL/(2*pi*f));
15 pf=(RT/Z);
16 i=(Pi/(Iac^2));

```

```

17 printf("\nFor dc      V=12 V,      I=2.5 A \nFor ac
          V=230 V,      I=2 A,      P=50 W");
18 printf("\nIn an iron-cored coil, there are two types
of losses \n(i) Losses in core known as core or
iron loss \n(ii) Losses in winding known as copper
loss");
19 printf("\nP=(I^2)*R+Pi \nP/(I^2)=R+((Pi)/(I^2)) \nRT
=R+(Pi/(I^2)) \nwhere R is the resistance of the
coil and (Pi/I^2) is the resistance which is
equivalent to the effect of iron loss");
20 printf("\nFor dc supply, f=0 \nXL=0");
21 printf("\nR=%0.1f Ohm", R);
22 printf("\nFor ac supply \nZ=%0.f Ohms", Z);
23 printf("\nIron loss Pi=P-I^2*R=%0.1f W", Pi);
24 printf("\nRT=(P/I^2)=%0.1f Ohm", RT);
25 printf("\nXL=sqrt((Z^2)-(RT^2))=%0.1f Ohm", XL);
26 printf("\nXL=2*pi*L \nInductance L=%0.3f H", L);
27 printf("\nPower factor =RT/Z=%0.3f (lagging)", pf
);
28 printf("\nThe series resistance equivalent to the
effect of iron loss= Pi/(I^2)=%0.1f Ohms", i);

```

Scilab code Exa 4.49 example49

```

1 //AC Circuits : example 4.49 :(pg 4.37 & 4.38)
2 f=50;
3 I1=4;
4 pf1=0.5;
5 V1=200;
6 I2=5;
7 pf2=0.8;
8 V2=40;
9 Z1=(V2/I2);
10 R=(Z1*pf2);
11 XL1=sqrt((Z1^2)-(R^2));

```

```

12 L1=(XL1/(2*%pi*f));
13 Z2=(V1/I1);
14 RT=(Z2*pf1);
15 XL2=sqrt((Z2^2)-(RT^2));
16 L2=(XL2/(2*%pi*f));
17 Pi=(V1*I1*pf1-(I1^2)*R);
18 printf("\nWith iron core      I=4 A      pf=0.5,      V
      =200 V \nWithout iron core      I=5 A      pf=0.8,
      V=40 V \nWhen the iron-core is removed,");
19 printf("\nZ=V/I=%0.1 f Ohms",Z1);
20 printf("\n pf=R/Z \nR=%0.1 f Ohms",R);
21 printf("\nXL=sqrt((Z^2)-(RT^2))=%0.1 f Ohms",XL1);
22 printf("\nXL=(2*pi*f*L) \nInductance      L=%0.4 f H",L1
      );
23 printf("\nWith iron core, \nZ=%0.1 f Ohms",Z2);
24 printf("\n pf=RT/Z \nRT=%0.1 f Ohm",RT);
25 printf("\nXL=sqrt((Z^2)-(RT^2))=%0.2 f Ohm",XL2);
26 printf("\nXL=(2*pi*f*L) \nInductance      L=%0.4 f H
      ",L2);
27 printf("\nIron loss      Pi=P=(I^2)*R \n=VIcos(phi)-
      I^2*R \n=%0.1 f W",Pi);

```

Scilab code Exa 4.51 example51

```

1 //AC Circuits : example 4.51 :(pg 4.40 & 4.41)
2 P=2000;
3 pf=0.5;
4 V=230;
5 S=(P/pf);
6 phi=acosd(pf);
7 I=(P/(V*pf));
8 Q=(V*I*sind(phi));
9 disp("P=2000 W");
10 disp(" pf=0.5 (leading)");
11 disp("V=230 V");

```

```

12 disp("P=V*I*cos(phi)");
13 printf("\nI=%0.2f A",I);
14 printf("\nS=V*I=P/cos(phi)=%0.f VA",S);
15 printf("\nphi=%0.f degrees",phi);
16 printf("\nQ=V*I*sin(phi)=%0.f VAR",Q);

```

Scilab code Exa 4.52 example52

```

1 //AC Circuits : example 4.52 :(pg 4.41)
2 V=240;
3 VR=100;
4 P=300;
5 f=50;
6 R=((VR^2)/P);
7 I=sqrt(P/R);
8 Z=V/I;
9 XC=sqrt((Z^2)-(R^2));
10 C=(1/(2*pi*f*XC));
11 VC=sqrt((V^2)-(VR^2));
12 VCmax=(VC*sqrt(2));
13 Qmax=(C*VCmax);
14 Emax=((1/2)*C*(VCmax^2));
15 printf("\nV=240 V \nVR=100 V \nP=300 W \nf=50 Hz");
16 printf("\nP=(VR^2)/R \nR=((VR^2)/P)=%0.2f Ohm",R);
17 printf("\nP=(I^2)*R \nI=sqrt((P/R)) \nI=%0.f A",I);
18 printf("\nZ=V/I=%0.f Ohm",Z);
19 printf("\nXC=sqrt((Z^2)-(R^2))=%0.2f Ohm",XC);
20 printf("\nXC=1/2*pi*f*C \nC=%0.2e F",C);
21 printf("\nVoltage across capacitor VC=sqrt((V^2)-(VR^2))=%0.2f V",VC);
22 printf("\nMaximum value of max charge \nVC=%0.2f V \nQmax=C*VCmax=%0.4f C",VCmax,Qmax);
23 printf("\nMax stored energy Emax=((1/2)*C*(VCmax^2)) \n=%0.2f J",Emax);

```

Scilab code Exa 4.53 example53

```
1 //AC Circuits : example 4.53 :(pg 4.42)
2 C=35*10^-6;
3 f=50;
4 XC=(1/(2*pi*f*C));
5 R=sqrt(3*(XC^2));
6 R^2=(3*(XC^2));
7 printf("\nC=35*10^-6 F \nf=50 Hz \nVC=1/2.V \nXC
   =1/(2*pi*f*C)=%.3 f Ohm",XC);
8 printf("\nVC=1/2.V \nXC.I=1/2.Z.I \nXC=1/2.Z \nZ=2.
   XC \nZ=sqrt((R^2)+(XC^2)) \n(2XC)^2=(R^2)+(XC^2)
   \n3XC^2=R^2");
9 mprintf("\nR^2=3*XC^2=%.2 f Ohm \nR=%.1 f Ohm",R^2,R);
```

Scilab code Exa 4.54 example54

```
1 //AC Circuits : example 4.54 :(pg 4.42)
2 V=125;
3 I=2.2;
4 P=96.8;
5 f=50;
6 Z=V/I;
7 R=(P/(I^2));
8 Xc=sqrt((Z^2)-(R^2));
9 C=(1/(2*pi*f*Xc));
10 printf("\nV=125 V \nP=96.8 W \nI=2.2 A \nf=50 Hz");
11 printf("\nZ=V/I=%.2 f A",Z);
12 printf("\nP=(I^2)*R \nR=%. f Ohm",R);
13 printf("\nXc=sqrt((Z^2)-(R^2))=%.2 f Ohm",Xc);
14 printf("\nXc=1/(2*pi*f*C) \n C=%.2 e F",C);
```

Scilab code Exa 4.57 Series RLC circuit

```
1 //AC Circuits : example 4.57 :(pg 4.46)
2 j=%i;
3 f=50;
4 L=0.22;
5 R1=3;
6 Z=3.8+j*6.4;
7 XL=2*pi*f*L;
8 R2=3.8;
9 R=R2-R1;
10 X=6.4;
11 XC=XL-X;
12 C=(1/(2*pi*f*XC));
13 printf("\nZ=(3.8+j*6.4) Ohm");
14 printf("\nXL=2*pi*f*L=%0.2 f Ohm",XL);
15 printf("\nZ=(3+j69.12+R-jXC) \n=(3+R)+j(69.12-XC)");
16 printf("\n3+R=3.8 \nR=%0.1 f Ohm",R);
17 printf("\nXC=%0.2 f Ohm",XC);
18 printf("\nXC=1/2.pi.f.C \nC=%0.e F",C);
```

Scilab code Exa 4.58 Series RLC circuit

```
1 //AC Circuits : example 4.58 :(pg 4.46)
2 R=20;
3 phi=45;
4 Z=R/cosd(phi);
5 XC=sqrt((Z^2)-(R^2));
6 XL=(2*XC);
7 w=1000;
8 L=(XL/w);
9 C=(1/(w*XC));
```

```

10 printf("\nvL=300 sin(1000 t) \nR=20 Ohm \nphi=45 \nVL(
    max)=2Vcc(max) \nsqrt(2)*VL=2*sqrt(2)*VC \nI*XL
    =2*I*XC \nXL=2*XC \ncos(phi)=R/Z");
11 printf("\nZ=%0.2 f Ohm", Z);
12 printf("\nZ=sqrt((R^2)+(XL-XC)^2) \nXC=%0. f Ohm", XC);
    //for series R-L-C ckt
13 printf("\nXL=2*XC =%0. f Ohm", XL);
14 printf("\nXL=w*L \nL=%0.2 f H", L);
15 printf("\nXC=1/w*C \nC=%0. e F", C);

```

Scilab code Exa 4.59 Series RLC circuit

```

1 //AC Circuits : example 4.59 :(pg 4.47)
2 pf=0.5;
3 C=79.59*10^-6;
4 f=50;
5 XC=(1/(2*pi*f*C));
6 R=pf*XC;
7 Zcoil=XC;
8 XL=sqrt((Zcoil^2)-(R^2));
9 L=(XL/(2*pi*f));
10 printf("\n pf=0.5 \nC=79.57 uF \nf=50 Hz \nVcoil=VC ")
    ;
11 printf("\nXC=1/2*pi*f*C =%0. f Ohm", XC);
12 printf("\nVcoil=VC \nZcoil=XC=%0. f Ohm", XC);
13 printf("\n pf of coil=cos(phi)=R/Zcoil \nResistance
    of coil R=%0. f Ohm", R);
14 printf("\nXL=sqrt((Zcoil^2)-(R^2))=%0.2 f Ohm", XL);
15 printf("\nXL=2*pi*f*L \nInductance of coil=%0.2 f H", L
    );

```

Scilab code Exa 4.60 Series RLC Circuit

```

1 //AC Circuits : example 4.60 :(pg 4.48)
2 f=50;
3 V=250;
4 R=5;
5 L=9.55;
6 Vcoil=300;
7 XL=2*%pi*f*L;
8 Zcoil=(sqrt((R^2)+(XL^2)));
9 I=Vcoil/Zcoil;
10 Z=V/I;
11 XC1=Zcoil-Z;
12 XC2=Zcoil+Z;
13 C1=(1/(2*%pi*f*XC1));
14 C2=(1/(2*%pi*f*XC2));
15 printf("\nV=250 V \nR=5 Ohm \nL=9.55 H \nVcoil=300 V
        ");
16 printf("\nXL=2*pi*f*L =%.f Ohm",XL);
17 printf("\nZcoil=sqrt(R^2)+(XL^2) =%.f Ohm",Zcoil);
18 printf("\nI=Vcoil/Zcoil =%.1f A",I);
19 printf("\nZ=V/I =%.f Ohm",Z); //total impedance
20 printf("\nZ=sqrt((R^2)+(XL-XC)^2) \nXC=%.f Ohm",XC1)
        ; //when XL>XC
21 printf("\nC=1/2*pi*f*XC =%.e F",C1);
22 printf("\nZ=sqrt((R^2)+(XC-XL)^2) \nXC=%.f Ohm",XC2)
        ; //when XC>XL
23 printf("\nC=%.e F",C2);

```

Scilab code Exa 4.79 Series Resonance

```

1 //AC Circuits : example 4.79 :(pg 4.64)
2 R=10;
3 L=0.01;
4 C=100*10^-6;
5 f0=(1/(2*%pi*sqrt(L*C)));
6 BW=(R/(2*%pi*L));

```

```

7 f1=f0-(BW/2);
8 f2=f0+(BW/2);
9 printf("\nR=10 Ohm \nL=0.01H \nC=100uF");
10 printf("\nf0=1/2*pi*sqrt(L*C)=%.2 f Hz",f0); //
    resonant frequency
11 printf("\nBW=R/2*pi*L =%.2 f Hz",BW); //bandwidth
12 printf("\nf1=f0-BW/2 \n=%.2 f Hz",f1); //lower
    frequency
13 printf("\nf2=f0+BW/2 =%.2 f Hz",f2); //higher
    frequency

```

Scilab code Exa 4.80 Series Resonance

```

1 //AC Circuits : example 4.80 :(pg 4.65)
2 R=10;
3 L=0.2;
4 C=40*10^-6;
5 V=100;
6 f0=(1/(2*pi*sqrt(L*C)));
7 I0=(V/R);
8 P0=((I0^2)*R);
9 pf=1;
10 Vr=(R*I0);
11 Vl=((2*pi*f0*L)*I0);
12 Vc=((1/(2*pi*f0*C))*I0);
13 Q=((1/R)*sqrt(L/C));
14 f1=(f0-(R/(4*pi*L)));
15 f2=(f0+(R/(4*pi*L)));
16 printf("\nR=10 Ohm \nL=0.2 H \nC=40uF \nV=100 V");
17 printf("\n(i) f0= 1/2*pi*sqrt(LC) =%.1 f Hz",f0); //
    resonant frequency
18 printf("\n(ii) I0= V/R =%. f A",I0); //current
19 printf("\n(iii) P0=(I0^2)*R =%. f W",P0); //power
20 printf("\n(iv) pf=1"); //power factor
21 printf("\n(v) Rv = R.I =%. f V",Vr); //voltage across

```

```

    resistor
22 printf("\n Lv = XL.I =%.1 f V",Vl); //voltage across
    inductor
23 printf("\n Cv = XC.I =%.1 f V",Vc); //voltage across
    capacitor
24 printf("\n(vi) Q =1/R*sqrt(L/C)=%.2 f",Q); //Quality
    factor
25 printf("\n(vii) f1 = f0-R/4.pi.L = %.2 f Hz",f1); //
    half power points
26 printf("\nf2=f0+R/4.pi.L = %.1 f Hz",f2);
27 // x initialisation
28 x=[-1:0.1:2*%pi];
29 //simple plot
30 plot(sin(x))

```

Scilab code Exa 4.81 Series Resonance

```

1 //AC Circuits : example 4.81 :(pg 4.66)
2 V=200;
3 Vc=5000;
4 I0=20;
5 C=4*10^-6;
6 R=V/I0;
7 Xco=Vc/I0;
8 f0=(1/(2*%pi*Xco*C));
9 L=(Xco/(2*%pi*f0));
10 printf("\nV=200 V \nI0= 20 A \nVc=5000 V \nC=4uF");
11 printf("\nR=V/I0 =%. f Ohm",R); //resistance
12 printf("\nXco=Vco/Io =%. f Ohm",Xco);
13 printf("\nXco=1/2*pi*f0*C \nf0=1/2*pi*Xco*C =%.2 f Hz
    ",f0);
14 printf("\nat resonance Xco=Xlo \nXlo=%. f Ohm",Xco);
15 printf("\nXlo=2*pi*f0*L \nL=%.2 f H",L);

```

Scilab code Exa 4.82 Series Resonance

```
1 //AC Circuits : example 4.82 :(pg 4.66)
2 V=230;
3 f0=50;
4 I0=2;
5 Vco=500;
6 R=V/I0;
7 Xco=Vco/I0;
8 C=(1/(2*%pi*f0*Xco));
9 L=(Xco/(2*%pi*f0));
10 printf("\nV = 230 V \nf0 = 50 Hz \nI0 = 2A \nVco =
    500 V");
11 printf("\nR=V/I0 =%.f Ohm",R);
12 printf("\nXco=Vco/I0 =%.f Ohm",Xco);
13 printf("\nXco=1/2.pi.f0.C \nC= %.e F",C);//
    capacitance
14 printf("\nXco=Xlo \nXlo=%.f Ohm",Xco);//at resonance
15 printf("\nXlo=2.pi.f0.L \nL=%.3f H",L);//inductance
```

Scilab code Exa 4.83 Series Resonance

```
1 //AC Circuits : example 4.82 :(pg 4.66)
2 R=2;
3 L=0.01;
4 V=200;
5 f0=50;
6 C=(1/(4*(%pi)^2*L*(f0^2)));
7 I0=V/R;
8 Vco=I0*(1/(2*%pi*f0*C));
9 printf("\nR= 2 Ohm \nL= 0.01 H \nV=200 V \nf0=50 Hz
    \nf0=1/(2.pi.sqrt(LC))");
```

```

10 printf("\nC = %.e F",C); // capacitance
11 printf("\nI0= V/R =%. f A",I0); // current
12 printf("\nVco=I0.Xco \n=%.2 f V",Vco); // voltage
    across capacitor

```

Scilab code Exa 4.84 Series Resonance

```

1 //AC Circuits : example 4.84 :(pg 4.67)
2 BW=400;
3 Vco=500;
4 R=100;
5 Vm=10;
6 V=(Vm/sqrt(2));
7 I0=V/R;
8 L=R/BW;
9 Q0=Vco/V;
10 C=(L/(Q0*R)^2);
11 f0=(1/(2*pi*sqrt(L*C)));
12 f1=(f0-(R/(4*pi*L))); //lower cut-off frequency
13 f2=(f0+(R/(4*pi*L))); //upper cut-off frequency
14 printf("\nv(t)=10sinwt \nVco=5000V \nBW=400rad/s \nR
    =100 Ohm");
15 printf("\nV=%.2 f V",V);
16 printf("\nI0=V/R=%.4 f A",I0);
17 printf("\nBW=R/L \nL=%.2 f H",L);
18 printf("\nQ0=Vco/V =%.2 f",Q0);
19 printf("\nQ0=1/R*sqrt(L/C) \nC=%.e F",C);
20 printf("\nf0=1/2.pi.sqrt(LC)=%.2 f Hz",f0);
21 printf("\nf1=f0-R/4.pi.L =%.2 f Hz",f1); //lower cut-
    off frequency
22 printf("\nf2=f0+R/4.pi.L =%.2 f Hz",f2); //upper cut-
    off frequency

```

Scilab code Exa 4.85 Series Resonance

```
1 //AC Circuits : example 4.85 :(pg 4.68)
2 R=500;
3 f1=100;
4 f2=10*10^3;
5 BW=f2-f1;
6 f0=((f1+f2)/2);
7 L=(R/(2*%pi*BW));
8 XL0=(2*%pi*f0*L);
9 C=(1/(2*%pi*f0*XL0));
10 Q0=((1/R)*(sqrt(L/C)));
11 printf("\nR= 500 Ohm \nf1 = 100 Hz \nf2=10kHz \nBW=
    f2-f1 =%. f Hz",BW);
12 printf("\nf1=f0-BW/2 -----(i) \nf2=f0+BW/2 -----(
    ii) \nf1+f2 =2f0 \nf0=(f1+f2)/2 =%. f Hz",f0);
13 printf("\nBW=R/2. pi . f0 . L \nL=%.6 f H",L);
14 printf("\nXL0=2. pi . f0 . L =%.2 f Ohm",XL0);
15 printf("\nXL0=XC0 =%.2 f Ohm",XL0); //at resonance
16 printf("\nXC0 =1/2. pi . f0 . C \nC=%.e F",C);
17 printf("\nQ0=(1/R*sqrt(L/C)) =%.4 f",Q0);
```

Scilab code Exa 4.87 Series Resonance

```
1 //AC Circuits : example 4.87 :(pg 4.69 & 4.70)
2 f0=10^6;
3 C1=500*10^-12;
4 C2=600*10^-12;
5 C=500*10^-12;
6 x=((2*%pi*f0)^2);
7 L=(1/(x*C));
8 XL=(2*%pi*f0*L);
9 y=2*%pi*f0*C2;
10 XC=(1/y);
11 R=sqrt(((XL-XC)^2)/3);
```



```

12 x=sqrt(L/C);
13 Q0=((1/R)*x);
14 printf("\nf0= 1MHz \nC1=500pF \nC2=600pF \nC=500pF")
    ;//At resonance
15 printf("\nf0=1/2.pi.sqrt(LC)\nL=%f H",L);
16 printf("\nXL=2.pi.f0.L=%f Ohm",XL);
17 printf("\nXC=1/2.pi.f0.C \nXC=%f Ohm",XC);
18 printf("\nI=1/2.I0 \nV/Z=1/2.V/R \nZ=2R");
19 printf("\nsqrt((R^2)-(XL-XC)^2)=2R \nR=%f Ohm",R);
    //Resistance of Inductor
20 printf("\nQ0=1/R.sqrt(L/C) \n=%f",Q0);

```

Scilab code Exa 4.88 Parallel Resonance

```

1 //AC Circuits : example 4.88 :(pg 4.72)
2 R=20;
3 C=100*10^-6;
4 L=0.2;
5 DR=(L/(C*R));
6 x=(1/(L*C));
7 y=((R/L)^2);
8 f0=((1/(2*pi))*sqrt(x-y));
9 DR=(L/(C*R));
10 printf("\nR=20 Ohm \nL=0.2 H \nC=100uF");
11 printf("\nf0=1/2.pi.sqrt(1/LC-R^2/L^2) \n=%f Hz",
    f0);
12 printf("\n dynamic resistance =L/CR \n= %f Ohm",DR)
    ;

```

Scilab code Exa 4.89 Parallel Resonance

```

1 //AC Circuits : example 4.89 :(pg 4.72 & 4.73)
2 R=20;

```

```

3 L=200*10^-6;
4 f=10^6;
5 V=230;
6 Rs=8000;
7 XL=2*pi*f*L;
8 x=((2*pi*f)^2);
9 y=((R/L)^2);
10 C=(1/((x+y)*L));
11 Q=((2*pi*f*L)/R);
12 Z=(L/(C*R));
13 ZT=(Rs+Z);
14 IT=(V/ZT);
15 printf("\nR=20 Ohm \nL=200uH \nf=10^6 \nV=230 V \nRs
    =8000 Ohm \nXL=2.pi.f.L =%.1f Ohm",XL);
16 printf("\nf0=1/2.pi.sqrt(1/LC-R^2/L^2) \nC=%.e F",C)
    ;
17 printf("\nQ0=2.pi.f.L/R =%.2f",Q); //quality factor
18 printf("\nZ=L/CR \n=%.f Ohm",Z); //dynamic impedance
19 printf("\nZt=%.f Ohm",ZT); //total equivalent Z at
    resonance
20 printf("\nIt=%.e A",IT); //total ckt current

```

Chapter 5

Steady State AC Analysis

Scilab code Exa 5.1 example1

```
1 //Steady-State AC Analysis
2 //page no - 5.1
3 //example 5.1
4 // A = p2z(R,Theta) - Convert from polar to complex
  form.
5 //   R is a matrix containing the magnitudes
6 //   Theta is a matrix containing the phase angles
  (in degrees).
7 function [A] = p2z(R,Theta)
8   if argn(2) <> 2 then
9     error("incorrect number of arguments.");
10  end
11  if ~and(size(R) == size(Theta)) then
12    error("arguments must be of the same dimension.")
13    ;
14  end
15  A = R.*exp(%i*%pi*Theta/180.);
16 endfunction
17 A=p2z(100,45); //converting from polar to rectangular
18 disp(A);
```

```

19 disp("Applying KVL to Mesh 1 we get :");
20 disp("(3+j14)I1-j10I2=70.710678+j70.710678");//
    Equation 1
21 disp("Applying KVL to Mesh 2 we get :");
22 disp("I1=0")//equation 2
23 disp("putting equation 2 in equation 1:")//putting
    equation 2 in equation 1
24 disp("I2=(70.710678+j70.710678)/-j10");
25 I2=A/10*%i;
26 disp(I2);
27 function [r,th]=rect2pol(x,y)
28 //rectangle to polar coordinate conversion
29 //based on "Scilab from a Matlab User's Point of
    View", Eike Rietsch,
30 2002
31 r=sqrt(x^2+y^2);
32 th = atan(y,x)*180/%pi;
33 endfunction
34 [r,th]=rect2pol(- 7.0710678,7.0710678)//converting
    back to polar form
35 disp(r);
36 disp(th);
37 disp("I2= mag - 10 ang - 135 A");

```

Scilab code Exa 5.2 example2

```

1 //Steady-State AC Analysis
2 //page no - 5.1
3 //example 5.1
4 // A = p2z(R,Theta) - Convert from polar to complex
    form.
5 // R is a matrix containing the magnitudes
6 // Theta is a matrix containing the phase angles
    (in degrees).
7 function [A] = p2z(R,Theta)

```

```

8  if argn(2) <> 2 then
9      error("incorrect number of arguments.");
10 end
11 if ~and(size(R) == size(Theta)) then
12     error("arguments must be of the same dimension.")
13     ;
13 end
14 A = R.*exp(%i*%pi*Theta/180.);
15 endfunction
16 A=p2z(10,30);
17 disp(A); //converting to rectangular form
18 M=[8-2*i, -3, 0; -3, 8+5*i, -5; 0, -5 7-2*i];
19 N=[A, 0, 0]'
20 O=inv(M);
21 X=O*N;
22 disp(X);
23 function [r,th]=rect2pol(x,y)
24 //rectangle to polar coordinate conversion
25 //based on "Scilab from a Matlab User's Point of
    View", Eike Rietsch,
26 2002
27 r=sqrt(x^2+y^2);
28 th = atan(y,x)*180/%pi;
29 endfunction
30 [r,th]=rect2pol(1.3340761,- 0.5209699)//converting
    back to polar form

```

Scilab code Exa 5.11 example11

```

1 //Steady-State AC Analysis
2 //page no - 5.10
3 //example 5.11
4 disp("when mag-50 ang-0 source is acting alone :");
5 function [A] = p2z(R,Theta)
6 if argn(2) <> 2 then

```

```

7     error("incorrect number of arguments.");
8     end
9     if ~and(size(R) == size(Theta)) then
10    error("arguments must be of the same dimension.")
        ;
11    end
12    A = R.*exp(%i*%pi*Theta/180.);
13    endfunction
14    A=p2z(50,0); //converting polar to rec
15    disp(A);
16    disp("when mag=4 ang=0 source is acting alone :");
17    Vab2=0;
18    disp("By Super-position theorem :")
19    disp("Vab=Vab1+Vab2");
20    Vab=A+Vab2;
21    printf("Vab = %.f", Vab);
22    function [r,th]=rect2pol(x,y)
23    //rectangle to polar coordinate conversion
24    //based on "Scilab from a Matlab User's Point of
        View", Eike Rietsch,
25    2002
26    r=sqrt(x^2+y^2);
27    th = atan(y,x)*180/%pi;
28    endfunction
29    [r,th]=rect2pol(50,0) //converting back to polar
        form
30    disp(r);
31    disp(th);
32    disp("Vab= mag=50 ang=0 V")

```

Chapter 6

Three phase Circuits

Scilab code Exa 6.8 Interconnection of Three phases

```
1 // Three-Phase Circuits :example 6.8 :(pg 6.14)
2 VL=440;
3 P=50*10^3;
4 IL=90;
5 Iph=IL/sqrt(3);
6 pf=(P/(sqrt(3)*VL*IL));
7 S=sqrt(3)*VL*IL;
8 printf("\nVL=440 V \nP=50kW \nIL=90 A");
9 printf("\nVL=Vph=%f V",VL); //For delta-connected
   load
10 printf("\nIph=IL/sqrt(3)=%f A",Iph);
11 printf("\nP=sqrt(3)*VL*IL*cos(phi)");
12 printf("\ncos(phi)=%f (lagging)",pf);
13 printf("\nS=sqrt(3)*VL*IL =%f VA",S);
```

Scilab code Exa 6.9 Interconnection of Three phases

```
1 // Three-Phase Circuits :example 6.9 :(pg 6.15)
```

```

2  IL=15;
3  P=11*10^3;
4  S=15*10^3;
5  VL=S/(sqrt(3)*IL);
6  Vph=VL/sqrt(3);
7  x=P/S;
8  phi=acosd(P/S);
9  Q=sqrt(3)*VL*IL*sind(phi);
10 Iph=IL;
11 Zph=Vph/Iph;
12 R=Zph*cosd(phi);
13 XL=Zph*sind(phi);
14 Vph1=VL;
15 Iph1=(Vph1/Zph);
16 IL1=sqrt(3)*Iph1;
17 P1=sqrt(3)*VL*IL1*cosd(phi);
18 Q1=sqrt(3)*VL*IL1*sind(phi);
19 printf("\nIL=15 A \nP=11kW \nS=15kVA ");
20 //For a star-connected load
21 printf("\nS=sqrt(3)*VL*IL \nVL=%0.2 f V",Vph);
22 printf("\ncos(phi)=P/S =%0.3 f",x);
23 printf("\nphi=%0.2 f degrees",phi);
24 printf("\nQ=sqrt(3).VL.IL.sin(phi) = %0.1 f VAR",Q);
25 printf("\nIph=IL = %0.f A",IL);
26 printf("\nZph=Vph/Iph = %0.2 f Ohm",Zph);
27 printf("\nR= Zph*cos(phi) =%0.2 f Ohm",R);
28 printf("\nXL=Zph*sin(phi)= %0.2 f Ohm",XL);
29 //If these coils are connected in Delta
30 printf("\nCph =VL =%0.2 f V",VL);
31 printf("\nZph= %0.2 f Ohm",Zph);
32 printf("\nIph=Vph/Zph =%0.2 f A ",Iph1);
33 printf("\nIL=sqrt(3)*Iph =%0.f A",IL1);
34 printf("\nP=sqrt(3)*VL*IL*cos(phi) =%0.2 f W",P1);
35 printf("\nQ=sqrt(3)*VL*IL*sin(phi) =%0.2 f VAR",Q1);

```

Scilab code Exa 6.10 Interconnection of Three phases

```
1 // Three-Phase Circuits :example 6.10 :(pg 6.16)
2 P=1500*10^3;
3 pf=0.85;
4 VL=2.2*10^3;
5 phi=acosd(pf);
6 IL=P/(sqrt(3)*VL*pf);
7 Iph=IL/sqrt(3);
8 AC=Iph*pf;
9 RC=Iph*sind(phi);
10 IAC=IL*pf;
11 IRC=IL*sind(phi);
12 printf("\nP=1500kW \n pf=0.85 (lagging) \n VL=2.2kV");
13 //For Delta-connected load
14 printf("\nP=sqrt(3)*VL*IL*cos(phi) \n IL=%0.2 f A", IL);
15 printf("\n Iph=IL/sqrt(3)= %0.2 f A", Iph);
16 //AC=Active Component
17 printf("\n AC=Iph*cos(phi) =%0.2 f A", AC); //in each
    phase of load
18 //RC=Reactive Component
19 printf("\n RC=Iph*sin(phi) =%0.2 f A", RC); //in each
    phase of load
20 //For star-connected source
21 printf("\n IAC =%0.2 f A", IAC); // current of AC in
    each phase of source
22 printf("\n IRC =%0.2 f A", IRC); // current of RC in
    each phase of source
```

Scilab code Exa 6.11 Interconnection of Three phases

```
1 // Three-Phase Circuits :example 6.11 :(pg 6.16)
2 VL=208;
3 P=1800;
4 IL=10;
```

```

5 Vph=VL/sqrt(3);
6 Zph=(Vph/IL);
7 pf=P/(sqrt(3)*VL*IL);
8 phi=acosd(pf);
9 Rph=Zph*pf;
10 Xph=Zph*sind(phi);
11 printf("\nVL=208 V \nP=1800 W \nIL= 10 A");
12 //For a Wye-connected load,
13 printf("\nVph = VL/sqrt(3) =%.2 f V",Vph);
14 printf("\nIph = IL =%. f A",IL);
15 printf("\nZph=Vph/Iph =%.2 f Ohm",Zph);
16 printf("\nP=sqrt(3)*VL*IL*cos(phi)");
17 printf("\ncos(phi)=%.1 f degrees",pf);
18 printf("\nphi=%. f degrees",phi);
19 printf("\nRph=Zph*cos(phi) =%.2 f Ohm",Rph);
20 printf("\nXph=Zph*sin(phi) =%.2 f Ohm",Xph);

```

Scilab code Exa 6.12 Interconnection of Three phases

```

1 // Three-Phase Circuits :example 6.12 :(pg 6.17)
2 P=100*10^3;
3 IL=80;
4 VL=1100;
5 f=50;
6 Vph=(VL/sqrt(3));
7 Iph=IL;
8 Zph=(Vph/Iph);
9 pf=(P/(sqrt(3)*VL*IL));
10 phi=acosd(pf);
11 Rph=Zph*pf;
12 Xph=Zph*sind(phi);
13 C=(1/(2*%pi*f*Xph));
14 printf("\nP=100kW \nIL=80 A \nVL=1100 V \nf=50 Hz");
15 //For a star-connected load
16 printf("\nVph =V/sqrt(3) =%.2 f",Vph);

```

```

17 printf("\nIph=IL =%.f A", Iph);
18 printf("\nZph=(Vph/Iph)= %.2f Ohm", Zph);
19 printf("\nP=sqrt(3)*VL*IL*cos(phi)");
20 printf("\ncos(phi)=%.3f (leading)", pf);
21 printf("\nphi=%.f degrees", phi);
22 printf("\nRph=Zph*cos(phi) =%.2f Ohm", Rph);
23 printf("\nXph =Zph*sin(phi) =%.f Ohm", Xph);
24 // as current is leading, reactance will be
    capacitive in nature
25 printf("\nXC=(1/2*pi*C)");
26 printf("\nC=%.e F", C);

```

Scilab code Exa 6.13 Interconnection of Three phases

```

1 // Three-Phase Circuits :example 6.13 :(pg 6.17 &
    6.18)
2 VL=400;
3 IL=34.65;
4 P=14.4*10^3;
5 Iph=(IL/sqrt(3));
6 Zph=(VL/Iph);
7 pf=(P/(sqrt(3)*VL*IL));
8 phi=acosd(pf);
9 Rph=(Zph*pf);
10 Xph=(Zph*sind(phi));
11 printf("\nVL=400 V \nIL=34.65 A \nP=14.4kW");
12 //For a Delta-connected load
13 printf("\nVL=Vph=%.f V", VL);
14 printf("\nIph=IL/sqrt(3)=%.f A", Iph);
15 printf("\nZph=Vph/Iph =%.f Ohm", Zph);
16 printf("\ncos(phi)=P/sqrt(3).VL.IL =%.1f", pf);
17 printf("\nphi=%.2f degrees", phi);
18 printf("\nRph=Zph*cos(phi) =%.f Ohm", Rph);
19 printf("\nXph=Zph*sin(phi)=%.f Ohm", Xph);

```

Scilab code Exa 6.14 Interconnection of Three phases

```
1 // Three-Phase Circuits :example 6.14 :(pg 6.18)
2 P=10.44*10^3;
3 VL=200;
4 pf=0.5;
5 x=acosd(pf);
6 IL=(P/(sqrt(3)*VL*pf));
7 Iph=(IL/sqrt(3));
8 Zph=(VL/Iph);
9 Rph=(Zph*pf);
10 Xph=(Zph*sind(x));
11 Q=(sqrt(3)*VL*IL*sind(x));
12 printf("\nP=10.44kW \nVL=200 V \n pf=0.5(leading)");
13 // For a delta-connected load ,
14 printf("\nVL=Vph=%f V",VL);
15 printf("\nP=qrt(3)*VL*IL*cos(phi) \nIL=%f A",IL);
16 printf("\nIph=IL/sqrt(3) =%f A",Iph);
17 printf("\nZph=Vph/Iph =%f Ohm",Zph);
18 printf("\nRph =Zph*cos(phi)=%f Ohm",Rph);
19 printf("\nXph=Zph*sin(phi)=%f Ohm",Xph);
20 printf("\nQ=sqrt(3)*VL*IL*sin(phi) = %f VAR",Q);
```

Scilab code Exa 6.17 Interconnection of Three phases

```
1 // Three-Phase Circuits :example 6.17 :(pg 6.20)
2 Po=200*10^3;
3 f=50;
4 VL=440;
5 N=0.91;
6 pf=0.86;
7 phi=acosd(pf);
```

```

8 Pi=(Po/N);
9 IL=(Pi/(sqrt(3)*VL*pf));
10 Iph=(IL/sqrt(3));
11 AC=(Iph*pf);
12 RC=(Iph*sind(phi));
13 printf("\nPo=200 kW \nf=50Hz \nVL= 440 V \nN=0.91 \
      npf=0.86");
14 //For a delta connected load (induction motor)
15 printf("\nVph =VL =%.1 f V",VL);
16 printf("\nN=(Po/Pi)"); // efficiency
17 printf("\nPi=%.1 f W",Pi); //Input power
18 printf("\nPi=sqrt(3)*VL*IL*cos(phi) \nIL=%.1 f A",IL)
      ;
19 printf("\nAC = (Iph*cos(phi))=%.1 f A",AC); // Active
      component of phase current
20 printf("\nRC=(Iph*sin(phi)) =%.1 f A",RC); //Reactive
      component of phase current

```

Scilab code Exa 6.18 Interconnection of Three phases

```

1 // Three-Phase Circuits :example 6.18 :(pg 6.20)
2 VL=400;
3 Po=112*10^3;
4 pf=0.86;
5 phi=(acosd(pf));
6 N=0.88; // Efficiency
7 Pi=(Po/N);
8 IL=(Pi/(sqrt(3)*VL*pf));
9 Iph=(IL/sqrt(3));
10 AC=(Iph*pf);
11 RC=(Iph*sind(phi));
12 Aac=(IL*pf);
13 Arc=(IL*sind(phi));
14 printf("\nVL=400 V \nPo=112kW \nnpf=0.86 \nN=0.88");
15 //For a mesh-connected load (induction motor)

```

```

16 printf("\nVph=VL=%f V",VL);
17 printf("\nN=Po/Pi \nP_i=%f W",Pi); //Input power
18 printf("\nP_i=sqrt(3)*VL*IL*cos(phi) \nIL=%f A", IL)
    ;
19 printf("\nIph=IL/sqrt(3) =%f A",Iph);
20 //current in star-connected load=line current drawn
    by motor
21 printf("\nI_A=%f A", IL); //current in alternate
    phase
22 printf("\nA_C=Iph*cos(phi) =%f A",AC); // active
    component in each phase of motor
23 printf("\nR_C=Iph*sin(phi) =%f A",RC); // Reactive
    component in each phase of motor
24 printf("\nA_ac=%f A",Aac); // active component in
    each alternate phase
25 printf("\nA_rc=%f A",Arc); //reactive component in
    each alternate phase

```

Scilab code Exa 6.19 Interconnection of Three phases

```

1 // Three-Phase Circuits :example 6.19 :(pg 6.21 &
    6.22)
2 VL=400;
3 IL=5;
4 Vph=(VL/sqrt(3));
5 Zph=(Vph/IL);
6 Iph=(IL/sqrt(3));
7 Vph1=(Iph*Zph);
8 printf("\nV_l=400 V \nIL=5 A");
9 //For a star-connected load
10 printf("\nVph=VL/sqrt(3) =%f V",Vph);
11 printf("\nIph=IL=%f A", IL);
12 printf("\nZph=Rph=Vph/Iph =%f Ohm", Zph);
13 //For a delta connected load
14 printf("\nIL=5 A \nRph=%f Ohm", Zph);

```

```

15 printf("\nIph=IL/sqrt(3)=%.2f A",Iph);
16 printf("\nVph=Iph*Rph \n=%.2f V",Vph1);
17 //Voltage needed is 1/3 of the star value

```

Scilab code Exa 6.20 Interconnection of Three phases

```

1 // Three-Phase Circuits :example 6.20 :(pg 6.22 &
   6.23)
2 VL=400;
3 Zph=100;
4 Vph=(VL/sqrt(3));
5 Iph=(Vph/Zph);
6 pf=1;
7 P=(sqrt(3)*VL*Iph*pf);
8 Iph1=(VL/Zph);
9 IL1=(sqrt(3)*Iph1);
10 P1=(sqrt(3)*VL*IL1*pf);
11 I1=(VL/200);
12 Pa=(VL*I1);
13 I2=(VL/100);
14 Pb=(VL*I1*I2);
15 printf("\nVL=400 V \nZph = 100 Ohm");
16 //For a star connected load
17 printf("\nVph=VL/sqrt(3) =%.2f V",Vph);
18 printf("\nIph = VL/Zph =%.2f A",Iph);
19 printf("\nIL=Iph =%.2f A",Iph);
20 printf("\ncos(phi)=1 \nP=sqrt(3).VL.IL.cos(phi) =%.2
   f W",P);
21 //For a delta connected load
22 printf("\nVph=VL=%.f V",VL);
23 printf("\nIph=Vph/Zph =%.f A",Iph1);
24 printf("\nIL=sqrt(3)*Iph =%.2f A",IL1);
25 printf("\nP=sqrt(3)*VL*IL*cos(phi) =%.2f W",P1);
26 //When resistors are open circuited
27 //(i)Star connection

```

```

28 printf("\nI= %.f A",I1); //Current in lines
29 printf("\nP=%.f W",Pa); //Power taken from mains
30 //(ii) Delta connection
31 printf("\nI=%.f A",I2); //Current in each phase
32 printf("\nP=%.f W",Pb); //Power taken from mains

```

Scilab code Exa 6.27 Measurement of three phase power

```

1 // Three-Phase Circuits :example 6.27 :(pg 6.30 &
   6.31)
2 W1=2000;
3 W2=500;
4 W3=-500;
5 x=(sqrt(3)*((W1-W2)/(W1+W2)));
6 phi=atand(x);
7 pf=cosd(phi);
8 y=(sqrt(3)*((W1-W3)/(W1+W3)));
9 phi1=atand(y);
10 pf1=cosd(phi1);
11 printf("\nW1 = 2000W \nW2 = 500 W");
12 //(i) When both readings are same
13 printf("\nWhen W1 &W2 are same \nW1 = 2000W \nW2 =
   500 W");
14 printf("\ntan(phi)= sqrt(3).*(W1-W2/W1+W2) =%.3f ",x)
   ;
15 printf("\nphi=%.3f degrees",phi);
16 printf("\n pf=cos(phi)=%.3f ",pf); //Power factor
17 //(ii) When the latter reading is obtained after
   reversing the connection to the current coil of 1
   instrument
18 printf("\nWhen W2 is reversed \nW1= 2000 W \nW2=
   -500 W");
19 printf("\ntan(phi)= sqrt(3).*(W1-W2/W1+W2) =%.3f ",y)
   ;
20 printf("\n phi=%.2f degrees",phi1);

```



```
21 printf("\npf=cos(phi)=%0.2 f ",pf1); //Power factor
```

Scilab code Exa 6.28 Measurement of three phase power

```
1 // Three-Phase Circuits :example 6.28 :(pg 6.31)
2 W1=5*10^3;
3 W2=-(0.5*10^3);
4 P=(W1+W2);
5 x=(sqrt(3)*((W1-W2)/(W1+W2)));
6 phi=atand(x);
7 pf=cosd(phi);
8 printf("\nW1=5kW \W2=0.5kW");
9 // When the latter readings are obtained after the
   reversal of the current coil terminals of the
   wattmeter
10 printf("\nWhen W2 is reversed \nW1=5kW \nW2=-0.5kW")
   ;
11 printf("\nP=W1+W2 = %0.1 f W",P); //Power
12 printf("\ntan(phi)=sqrt(3)*(W1-W2/W1+W2) =%0.2 f",x);
13 printf("\nphi= %0.2 f degrees ",phi);
14 printf("\npf=cos(phi) =%0.2 f",pf); //Power factor
```

Scilab code Exa 6.29 Measurement of three phase power

```
1 // Three-Phase Circuits :example 6.29 :(pg 6.31)
2 S=10*10^3;
3 pf=0.342;
4 x=(S/sqrt(3));
5 phi=acosd(pf);
6 W1=x*cosd(30+phi);
7 W2=x*cosd(30-phi);
8 printf("\nS=10kVA \npf=0.342 \nS=sqrt(3)*VL*IL");
9 printf("\nVL*IL=%0. f VA",x);
```

```

10 printf("\ncos(phi)=%.3f",pf);
11 printf("\nphi=%.f degrees",phi);
12 //(i)when power factor is leading
13 printf("\npf leading \nW1=VL.IL.cos(30+phi)= %.f W",
        W1);
14 printf("\n \nW2=VL.IL.cos(30-phi)= %.f W",W2);
15 //(i)when power factor is lagging
16 printf("\npf lagging \nW1=VL.IL.cos(30-phi)= %.f W",
        W2);
17 printf("\n \nW2=VL.IL.cos(30+phi)= %.f W",W1);

```

Scilab code Exa 6.30 Measurement of three phase power

```

1 // Three-Phase Circuits :example 6.30 :(pg 6.31 &
    6.32)
2 VL=2000;
3 N=0.9;//efficiency
4 W1=300*10^3;
5 W2=100*10^3;
6 P=W1+W2;
7 x=(sqrt(3)*((W1-W2)/(W1+W2)));
8 phi=atand(x);
9 pf=cosd(phi);
10 IL=(P/(sqrt(3)*VL*pf));
11 printf("\nVL=2000 V \nN=0.9 \nW1=300kW \nW2=100kW");
12 printf("\nP=W1+W2 =%.f W",P);//Input Power
13 printf("\ntan(phi)=(sqrt(3)*(W1-W2/W1+W2)) =%.3f",x)
    ;
14 printf("\nphi=%.2f degrees ",phi);
15 printf("\ncos(phi)=%.2f",pf);//Power factor
16 printf("\nP=sqrt(3)*VL*IL*cos(phi) \nIL=%.2f A",IL);

```

Scilab code Exa 6.31 Measurement of three phase power

```

1 // Three-Phase Circuits :example 6.31 :(pg 6.32)
2 VL=220;
3 Po=11.2*10^3;
4 N=0.88;//efficiency
5 IL=38;
6 Pi=(Po/N);
7 x=(Pi/(sqrt(3)*VL*IL));
8 phi=acosd(x);
9 W1=(VL*IL*cosd(30-phi));
10 W2=(VL*IL*cosd(30+phi));
11 printf("\nVL=220 V \nP0=11.2kW \nN=0.88 \nIL=38A \N
    =(Po/Pi)= %.2 f W",Pi);
12 printf("\nPi=sqrt(3)*VL*IL*cos(phi) \ncos(phi)=%.2 f
    lagging",x);
13 printf("\nphi=%.2 f degrees",phi);
14 printf("\nW1 =VL*IL*cos(30-phi) =%.2 f W",W1);
15 printf("\nW2 =VL*IL*cos(30+phi) =%.2 f W",W2);

```

Chapter 7

Graph Theory

Scilab code Exa 7.7 Graph of a Network

```
1 // Graph Theory : example 7.7 : (pg 7.18 & 7.19)
2 //Complete incidence matrix Aa
3 printf("\nAa=");
4 disp(Aa=[1 0 0 -1 1 0 0 0;-1 1 0 0 0 1 0 0;0 -1 1 0
          0 0 1 0;0 0 -1 1 0 0 0 1;0 0 0 0 -1 -1 -1 -1]);
5 //eliminating last row from Aa
6 printf("\nA=");
7 disp(A=[1 0 0 -1 1 0 0 0;-1 1 0 0 0 1 0 0;0 -1 1 0 0
          0 1 0;0 0 -1 1 0 0 0 1]);
8 //Tieset matrix B
9 printf("\ntwigs={1,3,5,7} \nlinks={2,4,6,8} \ntieset
          2={2,7,5,1} \ntieset 4={4,5,7,3} \ntieset
          6={6,5,1} \ntieset 8={8,7,3}");
10 // forward direction = 1, reverse direction = -1
11 printf("\nB=");
12 disp(B=[1 1 0 0 -1 0 1 1;0 0 1 1 1 0 -1 0;1 0 0 0 -1
          1 0 0;0 0 1 0 0 0 -1 1]);
13 // f-cutset matrix Q
14 printf("\nf-cutset 1={1,6,2} \nf-cutset 3={3,4,8} \
          nf-cutset 5={5,4,6,2} \nf-cutset 7={7,2,8,4}");
15 printf("\nQ=");
```

```

16 disp(Q=[1 -1 0 0 0 -1 0 0;0 0 1 -1 0 0 0 -1;0 1 0 -1
        1 1 0 0;0 -1 0 1 0 0 1 1]);

```

Scilab code Exa 7.8 Graph of a Network

```

1 // Graph Theory : example 7.8 :(pg 7.19 & 7.20)
2 //Complete Incidence Matrix Aa
3 printf("\nAa=");
4 disp(Aa=[1 0 -1 1;-1 1 0 0;0 -1 1 -1]);
5 // Reduced Incidence matrix A (by eliminating last
   row from Aa)
6 A=[1 0 -1 1;-1 1 0 0];
7 printf("\nA=");
8 disp(A=[1 0 -1 1;-1 1 0 0]);
9 printf("\nNumber of possible trees=|A*A^T|"); //A^T=A
   '= transpose of A
10 x=(A*A');
11 disp(x);
12 printf("\n|A*A^T|="); //determinant of A
13 disp(det(x));

```

Scilab code Exa 7.11 Graph of a Network

```

1 // Graph Theory : example 7.11 :(pg 7.21 & 7.22)
2 printf("\nAa=");
3 disp(Aa=[0 -1 1 0 0;0 0 -1 -1 -1;-1 0 0 0 1;1 1 0 1
   0]); //Complete incidence matrix
4 A=[0 -1 1 0 0;0 0 -1 -1 -1;-1 0 0 0 1]; //Reduced
   incidence matrix
5 printf("\nNumber of possible trees = |A*A^T|"); //A^T
   =A'=transpose of A
6 x=(A*A');
7 disp(x);

```

```

8 det(x);
9 printf("\n|A*A^T|=%. f", det(x)); //No. of possible
    trees
10 //Tieset Matrix B
11 printf("\ntwigs={3,4,5} \nlinks={1,2} \ntieset
    1={1,4,5} \ntieset 2={2,3,4}");
12 printf("\nB=");
13 disp(B=[1 0 0 -1 1;0 1 1 -1 0]);
14 //f-cutset Matrix Q
15 printf("\nf-cutset 3={3,2} \nf-cutset 4={4,2,1} \nf-
    cutset 5={5,1}");
16 printf("\nQ=");
17 disp(Q=[0 -1 1 0 0;1 1 0 1 0;-1 0 0 0 1]);

```

Scilab code Exa 7.14 Network Equilibrium Equation

```

1 //Graph Theory : example 7.14 :(pg 7.37 & 7.38)
2 //Tieset Matrix B
3 printf("\ntieset1={1,4,5} \ntieset2={2,4,6} \ntieset
    ={3,5,6} \nB=");
4 B=[1 0 0 1 1 0;0 1 0 -1 0 -1;0 0 1 0 -1 1];
5 disp(B);
6 printf("\nThe KVL equation in matrix form \nB.Zb.(B^
    T).I1 = B.Vs-B.Zb.Is");
7 printf("\nB.Zb.(B^T).I1 = B.Vs \nZb="); //Is=0
8 Zb=diag([1,1,1,2,2,2]);
9 disp(Zb);
10 printf("\n(B^T)=");
11 disp(B');
12 Vs=[2;0;0;0;0;0];
13 printf("\nVs=");
14 disp(Vs);
15 printf("\nB.Zb=");
16 x=(B*Zb);
17 disp(x);

```

```

18 printf("\nB.Zb.(B^T)=");
19 y=(x*B');
20 disp(y);
21 printf("\nB.Vs=");
22 z=(B*Vs);
23 disp(z);
24 printf("\nLoad currents:");
25 M=[5 -2 -2;-2 5 -2;-2 -2 5];
26 H=inv(M);
27 N=[2;0;0];
28 X=H*N;
29 disp(X);
30 printf("\nI11=0.857 A \nI12=0.571 A \nI13=0.571 A");
31 printf("\nBranch currents:");
32 P=(B')*X;
33 disp(P); // Currents in amperes

```

Scilab code Exa 7.15 Network Equilibrium Equation

```

1 //Graph Theory : example 7.15 :(pg 7.38 & 7.39)
2 //Tieset Matrix B
3 printf("\ntieset1={1,4,6} \ntieset2={2,5,6} \ntieset
   ={3,5,4} \nB=");
4 B=[1 0 0 1 0 1;0 1 0 0 1 -1;0 0 1 -1 -1 0];
5 disp(B);
6 printf("\nThe KVL equation in matrix form \nB.Zb.(B^
   T).I1 = B.Vs-B.Zb.Is");
7 printf("\nB.Zb.(B^T).I1 = B.Vs \nZb="); //Is=0
8 Zb=diag([6,4,3,4,6,2]);
9 disp(Zb);
10 printf("\n(B^T)=");
11 disp(B');
12 Vs=[12;-6;-8;0;0;0];
13 printf("\nVs=");
14 disp(Vs);

```

```

15 printf("\nB.Zb=");
16 x=(B*Zb);
17 disp(x);
18 printf("\nB.Zb.(B^T)=");
19 y=(x*B');
20 disp(y);
21 printf("\nB.Vs=");
22 z=(B*Vs);
23 disp(z);
24 printf("\nLoad currents=");
25 M=[12 -2 -4;-2 12 -6;-4 -6 12];
26 H=inv(M);
27 N=[12;-6;-8];
28 X=H*N;
29 disp(X);
30 printf("\nI1=0.55 A \nI2=-0.866 A \nI3=-0.916 A")
    ;

```

Scilab code Exa 7.19 Network Equilibrium Equation

```

1 //Graph Theory : example 7.15 :(pg 7.34 & 7.35)
2 Q=[1 -1 0 0;0 -1 1 1];
3 printf("\nQ=");
4 disp(Q);
5 printf("\nThe KCL equation in matrix form is given
    by");
6 printf("\nQ.Yb.(Q^T).Vl=Q.Is-Q.Yb.Vs");
7 printf("\nQ.Yb.(Q^T).Vl=Q.Is");//Vs=0
8 Yb=diag([5,5,5,10]);
9 Is=[-10;0;0;0];
10 printf("\nYb=");
11 disp(Yb);
12 printf("\n(Q^T)=");
13 disp(Q');
14 printf("\nIs=");

```



```

15 disp(Is); //current entering into nodes is taken as
    negative
16 x=(Q*Yb);
17 printf("\nQ.Yb=");
18 disp(x);
19 y=(x*Q');
20 printf("\nQ.Yb.(Q^T)=");
21 disp(y);
22 z=(Q*Is);
23 printf("\nQ.Is=");
24 disp(z);
25 printf("\nLoad voltages:");
26 M=[10 5;5 20];
27 P=inv(M);
28 N=[-10;0];
29 X=(P*N);
30 disp(X);
31 printf("\nv1=-1.14 V \nv2=0.28 V");

```

Scilab code Exa 7.20 Network Equilibrium Equation

```

1 //Graph Theory : example 7.20 :(pg 7.35 & 7.36)
2 printf("\nf-cutset1={1,4,5,6} \nf-cutset2={2,4,5} \
    nf-cutset3={3,4,6}");
3 Q=[1 0 0 -1 -1 1;0 1 0 -1 -1 0;0 0 1 -1 0 1];
4 printf("\nQ=");
5 disp(Q);
6 printf("\nThe KCL equation in matrix form is given
    by");
7 printf("\nQ.Yb.(Q^T).Vl=Q.Is-Q.Yb.Vs");
8 printf("\nQ.Yb.(Q^T).Vl=Q.Is"); // Is=0
9 Yb=diag([0.2,0.2,0.2,0.1,0.5,0.1]);
10 Vs=[9 10;0;0;0;0;0];
11 Is=[0;0;0;0;0;0];
12 printf("\nYb=");

```

```

13 disp(Yb);
14 printf("\nVs=");
15 disp(Vs);
16 printf("\nIs=");
17 disp(Is);
18 x=(Q*Yb);
19 printf("\nQ.Yb=");
20 disp(x);
21 y=(x*Q');
22 printf("\nQ.Yb.(Q^T)=");
23 disp(y);
24 z=(x*Vs);
25 printf("\nQ.Yb.Vs=");
26 disp(z);
27 printf("\nQ.Is=");
28 u=(Q*Is);
29 disp(Q*Is);
30 v=(u-z);
31 printf("\nQ.Is-Q.Yb.Vs=");
32 disp(v);
33 printf("\nLoad voltages:");
34 M=[0.9 0.6 0.2;0.6 0.8 0.1;0.2 0.1 0.3];
35 P=inv(M);
36 N=[-182;0;0];
37 X=(P*N);
38 disp(X);
39 printf("\nv1=-460 V \nv2=320 V \nv3=200 V");

```

Scilab code Exa 7.21 Network Equilibrium Equation

```

1 //Graph Theory : example 7.22 :(pg 7.38 & 7.39)
2 printf("\ntwigs={1,2} \nf-cutset1={1,4} \nf-cutset2
   ={2,3}");
3 Q=[1 0 0 -1;0 1 -1 0];
4 printf("\nQ=");

```

```

5 disp(Q);
6 printf("\nThe KCL equation in matrix form is given
   by");
7 printf("\nQ.Yb.(Q^T).Vl=Q.Is-Q.Yb.Vs");
8 Yb=diag([0.25,0.5,0.25,0.5]);
9 Vs=[1;1;0;0];
10 Is=[0;0;0.5;-0.5];
11 printf("\nYb=");
12 disp(Yb);
13 printf("\n(Q^T)=");
14 disp(Q');
15 printf("\nVs=");
16 disp(Vs);
17 printf("\nIs=");
18 disp(Is);
19 x=(Q*Yb);
20 printf("\nQ.Yb=");
21 disp(x);
22 y=(x*Q');
23 printf("\nQ.Yb.(Q^T)=");
24 disp(y);
25 printf("\nQ.Is=");
26 u=(Q*Is);
27 disp(Q*Is);
28 z=(x*Vs);
29 printf("\nQ.Yb.Vs=");
30 disp(z);
31 v=(u-z);
32 printf("\nQ.Is-Q.Yb.Vs=");
33 disp(v);
34 printf("\nLoad voltages:");
35 M=[0.75 0;0 0.75];
36 P=inv(M);
37 N=[0.25;-1];
38 X=(P*N);
39 disp(X);
40 printf("\nv11=0.33 V \nv12=-1.33 V");
41 v12=-1.33;

```

```
42 v=1+v12;  
43 printf("\nV=%0.2 f", v);
```

Chapter 8

Transient Analysis

Scilab code Exa 8.13 example13

```
1 //Transient analysis
2 //pg no - 8.17
3 //example no - 8.13
4 a=((10*30)/(10+30));
5 d=5/a;
6 b=0;
7 c=5*(20/30);
8 printf("iL(0-) = %.2f A", d);
9 printf("\nvb(0-) = %.f", b);
10 printf("\nva(0-) = %.2f V", c);
11 disp("Applying Kcl equations at t=0+");
12 disp("((va(0+)-5)/10)+(va(0+)/10)+(va(0+)-vb(0+))/20
      = 0"); //equation 1
13 disp("((vb(0+)-va(0+))/20)+((vb(0+)-5)/10)+(2/3) = 0
      "); //equation 2
14 //solving 1 and 2
15 M=[0.25, -0.05; -0.05, 0.15];
16 N=[0.5, -0.167]';
17 O=inv(M);
18 X=O*N;
19 disp(X);
```

```
20 disp(" va(0+)= 1.9 A");
21 disp(" vb(0+)= -0.477 A");
```

Scilab code Exa 8.14 example14

```
1 //Transient analysis
2 //pg no - 8.17
3 //example no - 8.13
4 disp(" va(0+) = 5V");
5 disp(" vb(0+) = 5V");
6 disp(" vb(0+) = 5V");
7 disp(" Writing KCL Equation at t=0+");
8 disp(" 0.25*va(0+) = 0.75");
9 x=(0.75)/(0.25);
10 printf(" va(0+) = %.f V", x);
```

Chapter 10

Network Functions

Scilab code Exa 10.35 Determination of Residue

```
1 // Network Functions : example 10.35 : (pg 10.35)
2 m=(2/(sqrt(2)*sqrt(10)));
3 a=90;
4 x=(a-atan(3)-atan(1));
5 printf("\nF(s) = (4s/s^2+2s+2) = 4s/(s+1-j)*(s+1+j)");
6 ;
7 printf("\n At s=j2");
8 //pmag = phasor magnitudes
9 printf("\n |F(j2)| = Product of pmag from all zeros to
10 j2/Product of pmag from all poles to j2");
11 printf("\n = %.3f",m);
12 printf("\n f(w) = atan(2/0)-atan(3)-atan(1) = %.2f
degrees",x);
```

Scilab code Exa 10.36 Determination of Residue

```
1 // Network Functions : example 10.36 : (pg 10.35 &
10.36)
```

```

2 m=((5*sqrt(17))/(sqrt(20)*4));
3 a=90;
4 w=(atand(4)+atand(4/3)-(a)-atand(4/2));
5 printf("\nF(s) = (s+1)(s+3)/s(s+2)");
6 printf("\nAt s=j4");
7 //vmag = vector magnitudes
8 printf("\nProduct of vmag from all zeros to j4/
   Product of vmag from all poles to j4");
9 printf("\n =%.2f",m);
10 printf("\nphi(w)= atand(4)+atand(4/3)-atand(4/0)-
   atand(4/2)");
11 printf("\n = %.2f degrees",w);

```

Chapter 11

Two Port Networks

Scilab code Exa 11.16 Two Port Parameters

```
1 //Two-Port Networks : example 11.16 :(pg11.39 )
2 V1s=25;
3 I1s=1;
4 I2s=2;
5 V1o=10;
6 V2o=50;
7 I2o=2;
8 h11=(V1s/I1s);
9 h21=(I2s/I1s);
10 h12=(V1o/V2o);
11 h22=(I2o/V2o);
12 printf("\nh11 = V1/I1 = %.f Ohm",h11);//when V2=0
13 printf("\nh21= I2/I1 = %.f",h21);//when V2=0
14 printf("\nh12 = V1/V2 = %.1 f",h12);//when I1=0
15 printf("\nh22 = I2/V2 = %.2 f mho",h22);//when I1=0
16 printf("\nth h-parameters are");
17 disp([h11 h12;h21 h22]);
```

Scilab code Exa 11.19 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.19 :(pg11.49 &
   11.50)
2 Z11=20;
3 Z22=30;
4 Z12=10;
5 Z21=10;
6 dZ=((Z11*Z22)-(Z12*Z21));
7 Y11=(Z22/dZ);
8 Y12=(-Z12/dZ);
9 Y21=(-Z21/dZ);
10 Y22=(Z11/dZ);
11 A=(Z11/Z21);
12 B=(dZ/Z21);
13 C=(1/Z21);
14 D=(Z22/Z21);
15 printf("\nY-parameters");
16 printf("\nY11 = Z22/dZ = %.2 f mho",Y11);
17 printf("\nY12 = -Z12/dZ = %.2 f mho",Y12);
18 printf("\nY21 = -Z21/dZ = %.2 f mho",Y21);
19 printf("\nY22 = Z11/dZ = %.2 f mho",Y22);
20 printf("\n Y-parameters are:");
21 disp([Y11 Y12;Y21 Y22]);//Y-parameters in matrix
   form
22 printf("\nABCD parameters");
23 printf("\nA = Z11/Z21 = %.f",A);
24 printf("\nB = dZ/Z21 = %.f",B);
25 printf("\nC = 1/Z21 = %.1 f",C);
26 printf("\nD = Z22/Z21 = %.f",D);
27 printf("\n ABCD parameters are:");
28 disp([A B;C D]);//ABCD parameters in matrix form

```

Scilab code Exa 11.20 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.20 :(pg11.50 &
   11.51)

```

```

2 a=0.5;
3 b=-0.2;
4 d=1
5 printf("\nI1 =0.5V1-0.2V2 \nI2=-0.2V1+V2");
6 printf("\n Y11 =I1/V1 =%.1 f mho",a); //when V2 is 0
    in the 1st eqn
7 printf("\n Y21 =I2/V1 =%.1 f mho",b); //when V2 is 0
    in the 1st eqn
8 printf("\n Y12 =I1/V2 =%.1 f mho",b); //when V1 is 0
    in the 2nd eqn
9 printf("\n Y22 =I2/V2 =%.f mho",d); //when V1 is 0 in
    the 2nd eqn
10 printf("\nY-parameters are");
11 disp([a b;d]);
12 dY=((a*d)-(b*b));
13 Z11=(d/dY);
14 Z12=(-b/dY);
15 Z21=(-b/dY);
16 Z22=(a/dY);
17 A=(-d/b);
18 C=(-dY/b);
19 D=(-a/b);
20 printf("\ndY=Y11.Y22-Y12.Y21 =%.2 f",dY);
21 printf("\nZ11 = Y22/dY = %.3 f Ohm",Z11);
22 printf("\nZ12 = -Y12/dY = %.3 f Ohm",Z12);
23 printf("\nZ21 = -Y21/-dY = %.3 f Ohm",Z21);
24 printf("\nZ22 = Y11/dY = %.3 f Ohm",Z22);
25 printf("\nZ-parameters :");
26 disp([Z11 Z12;Z21 Z22]);
27 printf("\nA =-Y22/Y21 =%.f",A);
28 printf("\nB = -1/Y21 =%.f",A);
29 printf("\nC = -dY/Y21 =%.1 f",C);
30 printf("\nD = -Y11/Y21 =%.1 f",D);
31 printf("\nABCD parameters :");
32 disp([A A;C D]);

```

Scilab code Exa 11.22 Interrelationships between parameters

```
1 //Two-Port Networks : example 11.22 :(pg11.52 &
   11.53)
2 printf("\nApplying KVL to Mesh 1 \nV1 = I1 - I3 - -
   - -(i)");
3 printf("\nApplying KVL to Mesh 2 \nV2 = -4I2 + 2I3 -
   - - (ii)");
4 printf("\nApplying KVL to Mesh 3 \nI3 = (1/5)I1 +
   (4/5)I2 - - - -(iii)");
5 //substituting (iii) in (i) & (ii),we get
6 printf("\nV1 = (4/5)I1 - (4/5)I2 \nV2 = (2/5)I1 -
   (12/5)I2");
7 printf("\nZ-parameters:");
8 a=4/5;b=-4/5;c=2/5;d=-12/5;
9 disp([a b;c d]);
10 dZ=(a*d)-(b*c);
11 Y11=(d/dZ);
12 Y12=(-b/dZ);
13 Y21=(-c/dZ);
14 Y22=(a/dZ);
15 printf("\nY-parameters are:");
16 printf("\ndZ = Z11.Z22 - Z12.Z21 = %.1 f",dZ);
17 printf("\nY11 = Z22/dZ = %.1 f mho",Y11);
18 printf("\nY12 = -Z12/dY = %.1 f mho",Y12);
19 printf("\nY21 = -Z21/-dY = %.1 f mho",Y21);
20 printf("\nY22 = Z11/dY = %.1 f mho",Y22);
21 disp([Y11 Y12;Y21 Y22]);
```

Scilab code Exa 11.23 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.23 :(pg11.53 &
   11.54)
2 printf("\nApplying KVL to Mesh 1 \nV1 = 4I1 - 2I3 -
   - - (i)");
3 printf("\nApplying KVL to Mesh 2 \nV2 = 4I2 + 2I3 -
   - - (ii)");
4 printf("\nApplying KVL to Mesh 3 \n-2I3 = I1 + I2 -
   - - (iii)");
5 //substituting (iii) in (i) & (ii),we get
6 printf("\nV1 = 5I1 + I2 \nV2 = -I1 + 3I2");
7 printf("\nZ-parameters:");
8 a=5;b=1;c=-1;d=3;
9 disp([a b;c d]);
10 dZ=(a*d)-(b*c);
11 h11=(dZ/d);
12 h12=(b/d);
13 h21=(-c/d);
14 h22=(1/d);
15 printf("\ndZ = Z11.Z22 - Z12.Z21 = %.1 f",dZ);
16 printf("\nh11 = dZ/Z22 = %.1 f ",h11);
17 printf("\nh12 = Z12/Z22 = %.1 f ",h12);
18 printf("\nh21 = -Z21/Z22 = %.1 f ",h21);
19 printf("\nh22 = 1/Z22 = %.1 f ",h22);
20 printf("\nh-parameters are:");
21 disp([h11 h12;h21 h22]);

```

Scilab code Exa 11.24 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.24 :(pg11.54 &
   11.55)
2 printf("\nApplying KCL to Node 3 \nV3 = V2/3 - - -
   -(i)");
3 printf("\nI1 = 2V1 - (2/3)V2 - - - -(ii)");
4 printf("\nI2 = 3V2 - (V2/3) = (8/3)V2 - - - -(iii)");
   ;

```

```

5 //Comparing (iii) & (ii) ,we get
6 printf("\nY-parameters:");
7 a=2;b=(-2/3);c=0;d=(8/3);
8 disp([a b;b d]);
9 dY=((a*d)-(b*c));
10 Z11=(d/dY);
11 Z12=(-b/dY);
12 Z21=(c/dY);
13 Z22=(a/dY);
14 printf("\ndY=Y11.Y22-Y12.Y21 =%.1 f",dY);
15 printf("\nZ11 = Y22/dY = %.1 f Ohm",Z11);
16 printf("\nZ12 = -Y12/dY = %.1 f Ohm",Z12);
17 printf("\nZ21 = -Y21/-dY = %.f Ohm",Z21);
18 printf("\nZ22 = Y11/dY = %.1 f Ohm",Z22);
19 printf("\nZ-parameters :");
20 disp([Z11 Z12;Z21 Z22]);

```

Scilab code Exa 11.25 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.25 :(pg11.55 &
  11.56)
2 printf("\nApplying KCL to Node 1 \nI1 = (-3/2)V1 -
  V2- - -(i)");
3 printf("\nApplying KCL to Node 2 \nI2 = 2V1 + 2V2 -
  - - -(ii)");
4 //observing (i) & (ii)
5 printf("\nY-parameters:");
6 a=(-3/2);b=(-1);c=2;d=2;
7 disp([a b;c d]);
8 dY=((a*d)-(b*c));
9 Z11=(d/dY);
10 Z12=(-b/dY);
11 Z21=(-c/dY);
12 Z22=(a/dY);
13 printf("\ndY=Y11.Y22-Y12.Y21 =%. f",dY);

```

```

14 printf("\nZ11 = Y22/dY = %.f Ohm",Z11);
15 printf("\nZ12 = -Y12/dY = %.f Ohm",Z12);
16 printf("\nZ21 = -Y21/-dY = %.f Ohm",Z21);
17 printf("\nZ22 = Y11/dY = %.1f Ohm",Z22);
18 printf("\nZ-parameters :");
19 disp([Z11 Z12;Z21 Z22]);

```

Scilab code Exa 11.26 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.22 :(pg11.52 &
  11.53)
2 printf("\nApplying KVL to Mesh 1 \nV1 = 2I1 + I2 - -
  - -(i)");
3 printf("\nApplying KVL to Mesh 2 \nV2 = 10I1 + 11I2
  - - - -(ii)");
4 //observing (i) & (ii)
5 printf("\nV1 = (4/5)I1 - (4/5)I2 \nV2 = (2/5)I1 -
  (12/5)I2");
6 printf("\nZ-parameters :");
7 a=2;b=1;c=10;d=11;
8 disp([a b;c d]);
9 dZ=(a*d)-(b*c);
10 Y11=(d/dZ);
11 Y12=(-b/dZ);
12 Y21=(-c/dZ);
13 Y22=(a/dZ);
14 printf("\nY-parameters are:");
15 printf("\ndZ = Z11.Z22 - Z12.Z21 = %.1f",dZ);
16 printf("\nY11 = Z22/dZ = %.1f mho",Y11);
17 printf("\nY12 = -Z12/dY = %.1f mho",Y12);
18 printf("\nY21 = -Z21/-dY = %.1f mho",Y21);
19 printf("\nY22 = Z11/dY = %.1f mho",Y22);
20 disp([Y11 Y12;Y21 Y22]);
21 h11=(dZ/d);
22 h12=(b/d);

```

```

23 h21=(-c/d);
24 h22=(1/d);
25 printf("\ndZ = Z11.Z22 - Z12.Z21 = %.1 f",dZ);
26 printf("\nh11 = dZ/Z22 = %.1 f Ohm ",h11);
27 printf("\nh12 = Z12/Z22 = %.1 f ",h12);
28 printf("\nh21 = -Z21/Z22 = %.1 f ",h21);
29 printf("\nh22 = 1/Z22 = %.1 f mho",h22);
30 printf("\nh-parameters are:");
31 disp([h11 h12;h21 h22]);

```

Scilab code Exa 11.27 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.27 :(pg11.58)
2 printf("\nApplying KCL to Node 1 \nI1 = 4V1 - 3V2- -
   -(i)");
3 printf("\nApplying KCL to Node 2 \nI2 = -3V1 + 1.5V2
   - - - -(ii)");
4 //observing (i) & (ii)
5 printf("\nY-parameters:");
6 a=4;b=(-3);c=(-3);d=1.5;
7 disp([a b;c d]);
8 dY=((a*d)-(b*c));
9 Z11=(d/dY);
10 Z12=(-b/dY);
11 Z21=(-c/dY);
12 Z22=(a/dY);
13 printf("\ndY=Y11.Y22-Y12.Y21 =%. f",dY);
14 printf("\nZ11 = Y22/dY = %. f Ohm",Z11);
15 printf("\nZ12 = -Y12/dY = %. f Ohm",Z12);
16 printf("\nZ21 = -Y21/-dY = %. f Ohm",Z21);
17 printf("\nZ22 = Y11/dY = %.1 f Ohm",Z22);
18 printf("\nZ-parameters :");
19 disp([Z11 Z12;Z21 Z22]);

```

Scilab code Exa 11.28 Interrelationships between parameters

```
1 //Two-Port Networks : example 11.28 :(pg11.58 &
   11.59)
2 printf("\nApplying KCL to Node 1 \nI1 = 1.5V1 - 0.5
   V2- - -(i)");
3 printf("\nApplying KCL to Node 2 \nI2 = 4V1 - 0.5V2
   - - - -(ii)");
4 //observing (i) & (ii)
5 printf("\nY-parameters:");
6 a=1.5;b=(-0.5);c=(4);d=(-0.5);
7 disp([a b;c d]);
8 dY=((a*d)-(b*c));
9 Z11=(d/dY);
10 Z12=(-b/dY);
11 Z21=(-c/dY);
12 Z22=(a/dY);
13 printf("\ndY=Y11.Y22-Y12.Y21 =%. f",dY);
14 printf("\nZ11 = Y22/dY = %. f Ohm",Z11);
15 printf("\nZ12 = -Y12/dY = %. f Ohm",Z12);
16 printf("\nZ21 = -Y21/-dY = %. f Ohm",Z21);
17 printf("\nZ22 = Y11/dY = %.1 f Ohm",Z22);
18 printf("\nZ-parameters :");
19 disp([Z11 Z12;Z21 Z22]);
```

Scilab code Exa 11.29 Interrelationships between parameters

```
1 //Two-Port Networks : example 11.29 :(pg11.59 &
   11.60)
2 printf("\nApplying KCL to Node 1 \nI1 = 3V1 - 2V2- -
   -(i)");
```

```

3 printf("\nApplying KCL to Node 2 \nI2 = 3V2 - V3 - -
  - -(ii)");
4 printf("\nApplying KCL to Node 3 \nV3 = (1/3)V2 - -
  - -(ii)");
5 //substituting (iii) in (i) & (ii),we get
6 printf("\nI1 = 3V1 - (2/3)V2 \nI2 = 0V1 + (8/3)V2");
7 printf("\nY-parameters:");
8 a=3;b=(-2/3);c=(0);d=(8/3);
9 disp([a b;c d]);
10 dY=((a*d)-(b*c));
11 Z11=(d/dY);
12 Z12=(-b/dY);
13 Z21=(c/dY);
14 Z22=(a/dY);
15 printf("\ndY=Y11.Y22-Y12.Y21 =%. f",dY);
16 printf("\nZ11 = Y22/dY = %.1 f Ohm",Z11);
17 printf("\nZ12 = -Y12/dY = %.1 f Ohm",Z12);
18 printf("\nZ21 = -Y21/-dY = %. f Ohm",Z21);
19 printf("\nZ22 = Y11/dY = %.1 f Ohm",Z22);
20 printf("\nZ-parameters :");
21 disp([Z11 Z12;Z21 Z22]);

```

Scilab code Exa 11.30 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.30 :(pg11.60 &
  11.561)
2 printf("\nApplying KVL to Mesh 1 \nV1 = 4I1 + (0.05)
  I2 - - - -(i)");
3 printf("\nApplying KVL to Mesh 2 \nV2 = 2I1 - 10I2 -
  - -(ii)");
4 //substituting (i) in (ii),
5 printf("\nV2 = -40I1 + (1.5) I2");
6 printf("\nZ-parameters:");
7 a=4;b=0.05;c=-40;d=1.5;
8 disp([a b;c d]);

```

```

 9 dZ=(a*d)-(b*c);
10 Y11=(d/dZ);
11 Y12=(b/dZ);
12 Y21=(-c/dZ);
13 Y22=(a/dZ);
14 printf("\nY-parameters are:");
15 printf("\ndZ = Z11.Z22 - Z12.Z21 = %.1 f",dZ);
16 printf("\nY11 = Z22/dZ = %.1 f mho",Y11);
17 printf("\nY12 = -Z12/dY = %. f mho",Y12);
18 printf("\nY21 = -Z21/-dY = %.1 f mho",Y21);
19 printf("\nY22 = Z11/dY = %.1 f mho",Y22);
20 disp([Y11 Y12;Y21 Y22]);

```

Scilab code Exa 11.31 Interrelationships between parameters

```

1 //Two-Port Networks : example 11.31 :(pg11.61 &
  11.62)
2 printf("\nApplying KVL to Mesh 1 \nV1 = 3I1 + 5I2 -
  - - (i)");
3 printf("\nApplying KVL to Mesh 2 \nV2 = 2I1 + 4I2 -
  2I3 - - - (ii)");
4 printf("\nApplying KVL to Mesh 3 \nI3 = 2V3 - - - -(
  iii)");
5 //substituting (iii) in (i) & (ii),we get
6 printf("\n2V3 = 4I1 + 4I2 \nV2 = -6I1 + 4I2");
7 printf("\nZ-parameters:");
8 a=3;b=5;c=-6;d=-4;
9 disp([a b;c d]);
10 dZ=(a*d)-(b*c);
11 Y11=(d/dZ);
12 Y12=(-b/dZ);
13 Y21=(-c/dZ);
14 Y22=(a/dZ);
15 printf("\nY-parameters are:");
16 printf("\ndZ = Z11.Z22 - Z12.Z21 = %.1 f",dZ);

```

```
17 printf("\nY11 = Z22/dZ = %.1 f mho", Y11);
18 printf("\nY12 = -Z12/dY = %.1 f mho", Y12);
19 printf("\nY21 = -Z21/-dY = %.1 f mho", Y21);
20 printf("\nY22 = Z11/dY = %.1 f mho", Y22);
21 disp([Y11 Y12; Y21 Y22]);
```

Chapter 12

Network Synthesis

Scilab code Exa 12.2 Hurwitz Polynomials

```
1 // Network Synthesis : example 12.2 : (pg 12.2)
2 s=poly(0, 's ');
3 p1=((s^4)+(5*(s)^2)+4);
4 p2=((s^3)+(3*s));
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
9 printf("\nEven part of P(s) = (s^4)+(5s^3)+4");
10 printf("\nOdd part of P(s) = (s^3)+(3s)");
11 printf("\nQ(s)= m(s)/n(s)");
12 // values of quotients in continued fraction
    expansion
13 disp(q);
14 disp(q1);
15 disp(q2);
16 disp(q3);
17 printf("\nSince all the quotient terms are positive ,
    P(s) is hurwitz");
```

Scilab code Exa 12.3 Hurwitz Polynomial

```
1 // Network Synthesis : example 12.3 : (pg 12.2 &
   12.3)
2 s=poly(0, 's');
3 p1=((s^3)+(5*(s)));
4 p2=((4*s^2)+(2));
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 printf("\nEven part of P(s) = ((4*s^2)+(2))");
9 printf("\nOdd part of P(s) = ((s^3)+(5*(s)))");
10 printf("\nQ(s)= n(s)/m(s)");
11 // values of quotients in continued fraction
   expansion
12 disp(q);
13 disp(q1);
14 disp(q2);
15 printf("\nSince all the quotient terms are positive ,
   P(s) is hurwitz");
```

Scilab code Exa 12.4 Hurwitz Polynomials

```
1 // Network Synthesis : example 12.4 : (pg 12.3)
2 s=poly(0, 's');
3 p1=((s^4)+(3*(s)^2)+12);
4 p2=((s^3)+(2*s));
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
```

```

9 printf("\nEven part of P(s) = ((s^4)+(3*(s)^2)+12)")
    ;
10 printf("\nOdd part of P(s) = ((s^3)+(2*s))");
11 printf("\nQ(s)= m(s)/n(s)");
12 // values of quotients in continued fraction
    expansion
13 disp(q);
14 disp(q1);
15 disp(q2);
16 disp(q3);
17 printf("\nSince two quotient terms are negative , P(s
    ) is not hurwitz");

```

Scilab code Exa 12.5 Hurwitz Polynomials

```

1 // Network Synthesis : example 12.5 : (pg 12.3 &
    12.4)
2 s=poly(0, 's');
3 p1=((s^4)+(2*(s)^2)+2);
4 p2=((s^3)+(3*s));
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
9 printf("\nEven part of P(s) = ((s^4)+(2*(s)^2)+2)");
10 printf("\nOdd part of P(s) = (s^3)+(3s)");
11 printf("\nQ(s)= m(s)/n(s)");
12 // values of quotients in continued fraction
    expansion
13 disp(q);
14 disp(q1);
15 disp(q2);
16 disp(q3);
17 printf("\nSince two terms are negative , P(s) is not
    hurwitz");

```

Scilab code Exa 12.6 Hurwitz Polynomials

```
1 // Network Synthesis : example 12.6 : (pg 12.4)
2 s=poly(0, 's ');
3 p1=((2*(s^4))+(6*(s)^2)+1);
4 p2=((5*(s^3))+(3*s));
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
9 printf("\nEven part of P(s) = ((2*s^4)+(6*(s)^2)+1)");
10 printf("\nOdd part of P(s) = ((5*s^3)+(3*s))");
11 printf("\nQ(s)= m(s)/n(s)");
12 // values of quotients in continued fraction
    expansion
13 disp(q);
14 disp(q1);
15 disp(q2);
16 disp(q3);
17 printf("\nSince all the quotient terms are positive ,
    P(s) is hurwitz");
```

Scilab code Exa 12.7 Hurwitz Polynomials

```
1 // Network Synthesis : example 12.7 : (pg 12.4 &
    12.5)
2 s=poly(0, 's ');
3 p1=((s^4)+(6*(s)^2)+8);
4 p2=(7*(s^3)+(21*s));
5 [r,q]=pdiv(p1,p2);
```



```

6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
9 printf("\nEven part of P(s) = ((s^4)+(6*(s)^2)+8)");
10 printf("\nOdd part of P(s) = (7*(s^3)+(21*s))");
11 printf("\nQ(s)= m(s)/n(s)");
12 // values of quotients in continued fraction
    expansion
13 disp(q);
14 disp(q1);
15 disp(q2);
16 disp(q3);
17 printf("\nSince all the quotient terms are positive ,
    P(s) is hurwitz");

```

Scilab code Exa 12.8 Hurwitz Polynomials

```

1 // Network Synthesis : example 12.8 : (pg 12.5)
2 s=poly(0,'s');
3 p1=((s^4)+(5*(s)^2)+10);
4 p2=(5*(s^3)+(4*s));
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
9 printf("\nEven part of P(s) = ((s^4)+(5*(s)^2)+10)");
    ;
10 printf("\nOdd part of P(s) = (5*(s^3)+(4*s))");
11 printf("\nQ(s)= m(s)/n(s)");
12 // values of quotients in continued fraction
    expansion
13 disp(q);
14 disp(q1);
15 disp(q2);
16 disp(q3);

```

```
17 printf("\nSince two terms are negative , P(s) is not
    hurwitz");
```

Scilab code Exa 12.9 Hurwitz Polynomials

```
1 // Network Synthesis : example 12.9 : (pg 12.6)
2 s=poly(0, 's');
3 p1=((s^5)+(3*(s^3))+(2*s));
4 p2=((5*(s^4))+9*(s^2)+2);
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
9 [r4,q4]=pdiv(r2,r3);
10 printf("\n P(s) = ((s^5)+(3*(s^3))+(2*s))");
11 printf("\n d/ds.P(s)= ((5*(s^4))+9*(s^2)+2)");
12 printf("\nQ(s)=P(s)/d/ds.P(s)");
13 // values of quotients in continued fraction
    expansion
14 disp(q);
15 disp(q1);
16 disp(q2);
17 disp(q3);
18 disp(q4);
19 printf("\nSince all the quotient terms are positive ,
    P(s) is hurwitz");
```

Scilab code Exa 12.10 Hurwitz Polynomials

```
1 // Network Synthesis : example 12.10 : (pg 12.6 &
    12.7)
2 s=poly(0, 's');
3 p1=((s^5)+((s^3))+(s));
```

```

4 p2=((5*(s^4))+3*(s^2)+1);
5 [r,q]=pdiv(p1,p2);
6 [r1,q1]=pdiv(p2,r);
7 [r2,q2]=pdiv(r,r1);
8 [r3,q3]=pdiv(r1,r2);
9 [r4,q4]=pdiv(r2,r3);
10 printf("\n P(s) = ((s^5)+((s^3))+(s))");
11 printf("\n d/ds.P(s)= ((5*(s^4))+3*(s^2)+1)");
12 printf("\nQ(s)=P(s)/d/ds.P(s)");
13 // values of quotients in continued fraction
    expansion
14 disp(q);
15 disp(q1);
16 disp(q2);
17 disp(q3);
18 disp(q4);
19 printf("\nSince two quotient terms are negative, P(s
    ) is not hurwitz");

```
