

Scilab Textbook Companion for  
Electrical Network  
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May 26, 2016

<sup>1</sup>Funded by a grant from the National Mission on Education through ICT, <http://spoken-tutorial.org/NMEICT-Intro>. This Textbook Companion and Scilab codes written in it can be downloaded from the "Textbook Companion Project" section at the website <http://scilab.in>

# Book Description

**Title:** Electrical Network

**Author:** R. Singh

**Publisher:** Tata McGraw-Hill, New Delhi

**Edition:** 1

**Year:** 2008

**ISBN:** 978-0-07-026096-2

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 = %
      .3 f 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=%0.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=%0.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=%0.f Hz",f);
9 Vavg=((2*Vm)/pi);
10 Vrms=(Vm/sqrt(2));
11 mprintf('\nFor a sinusoidal waveform , \nVavg=(2*Vm/
pi) \nVrms=(Vm/sqrt(2))');
12 kf=(Vrms/Vavg);
13 kc=(Vm/Vrms);
14 mprintf('\nform fator=%0.2 f',kf);
15 mprintf('\ncrest factor=%0.2 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
      f Ohms",Zcoil);
20 printf("\nReactance of coil
      -(r^2)) =%f Ohms",XL);
21 printf("\nCombined resistance
      RT);
22 printf("\nCombined impedance
      +(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=%0.2 f 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)=%0.2 f 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))=%0.2 f Ohm",XC);
20 printf("\nXC=1/2*pi*f*C \nC=%0.2 e F",C);
21 printf("\nVoltage across capacitor VC=sqrt((V^2)-(VR
    ^2))=%0.2 f V",VC);
22 printf("\nMaximum value of max charge \nVC=%0.2 f V \
    nQmax=C*VCmax=%0.4 f C",VCmax,Qmax);
23 printf("\nMax stored energy Emax=((1/2)*C*(VCmax^2))
    \n=%0.2 f 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=300sin(1000t) \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=79.57uF \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*103;
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("\nVl=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("\nphi=%.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("\n pf 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("\n pf 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("\nv11=-460 V \nv12=320 V \nv13=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=%0.2f",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
13 degrees",x);
```

---

Scilab code Exa 10.36 Determination of Residue

```
1 // Network Functions : example 10.36 : (pg 10.35 &
2 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 = %.1 f 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 = %.1 f", dZ);
16 printf("\nY11 = Z22/dZ = %.1 f mho", Y11);
17 printf("\nY12 = -Z12/dY = %.1 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]);
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");

```

---