Scilab Textbook Companion for Basic Electrical And Electronics Engineering by B. R. Patil[1]

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Book Description

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Scilab numbering policy used in this document and the relation to the above book.

Exa Example (Solved example)

Eqn Equation (Particular equation of the above book)

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

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

Contents

List of Scilab Codes

Chapter 1

DC Circuits

Scilab code Exa 1.1 Resistance of Copper coil at 0 deg C

```
alpha0=0.0043;                    //Assigning values to the parameters
t=50;
R0=40;
R50=R0*(1+0.0043*50);             // Calculating the risistance at 50 deg C
disp(R50,"Resistance at 50 deg C");
```

Scilab code Exa 1.2 Temperature coefficient and resistance of field winding

```
R18=12.7;                               //Assigning values to the parameters
R50=14.3;
t1=18;
t2=50;
alpha0=(R50-R18)/(t2*R18-t1*R50);
alpha18=alpha0/(1+t1*alpha0);
```

```
R0=R18/(1+t1*alpha0);                    // Calculating
   resistance at 0 deg C
disp(alpha0,"Temperature coefficient at 0 deg C");
disp(alpha18,"temperature coefficient at 18 deg C");
disp(R0,"Resistance at 0 deg C");
```

Scilab code Exa 1.3 Resistance at 60 deg C of aluminium wire

```
alpha20=0.00403;                         //Assigning
   values to the parameters
t1=20;
t2=60;
R20=28.3;
R60=R20*(1+alpha20*(t2-t1));             // Calculating
   value of resistance at 60 deg C
disp(R60,"Resistance at 60 deg C is");
```

Scilab code Exa 1.4 Resistance at 50 deg C of shunt winding of motor

```
R15=80;                     //Assigning values to the
   parameters
alpha0=0.004;
t1=15;
t2=50;
R0=R15/(1+alpha0*t1);       // Calculating resistance
   at 0 deg C
R50=R0*(1+alpha0*t2);       // Calculating resistance
   at 50 deg C
disp(R0,"Resistance value at 0 deg C");
disp(R50,"Resistance value at 50 deg C");
```

Scilab code Exa 1.5 Temperature coefficient of material

```
R10=80;                    //Assigning values to the parameters
R60=96.6;
t1=10;
t2=60;
alpha0=(R60-R10)/(t2*R10-t1*R60);
disp(alpha0,"temperature coefficient at 0 deg C is");
```

Scilab code Exa 1.6 Average temperature

```
t1=20;                    //Assigning values to the parameters
R1=45;
R2=48.5;
alpha0=0.004;
t2=((R2*(1+alpha0*t1))-45)/(alpha0*R1);        //calculating average temperature
disp(t2,"Average temperature of winding at the end of the run when the resistance increases");
```

Scilab code Exa 1.7 Mean temperature

```
t1=20;                                  //Assigning values to the parameters
R1=18;
t2=50;
R2=20;
R3=21;
ts=15;
alpha0=(R2-R1)/(t2*R1-t1*R2);
```

```
t=((R3*(1+alpha0*20))-R1)/(alpha0*R1);
disp(alpha0," Temperature Coefficient at 0 deg C");
trise=t-ts;
disp(trise,"mean temperature rise");
```

Scilab code Exa 1.8 To determine current through series connection of resistors

```
R1=5;                              //Assigning values to the
    parameters
R2=7;
R3=8;
Req=R1+R2+R3;                      // Calculating equivalent
   resistance
V=100;
I=V/Req;
V1=I*R1;
V2=I*R2;
V3=I*R3;
disp("Volts",V1,"Voltage across 5 Ohm resistor");
disp("Volts",V2,"Voltage across 7 Ohm resistor");
disp("Volts",V3,"Voltage across 8 Ohm resistor");
```

Scilab code Exa 1.9 To determine current and voltage through parallel connection of resistors

```
V=100;                        //Assigning values to the
   parameters
R1=5;
R2=10;
R3=20;
I1=V/R1;
I2=V/R2;
```

```
I3=V/R3;
Itot=I1+I2+I3;          //Calculating total current
disp("Amperes",I1,"Current through 5 Ohm resistor");
disp("Amperes",I2,"Current through 10 Ohm resistor");
disp("Amperes",I3,"Current through 20 Ohm resistor");
disp("Amperes",Itot,"Total current");
P=Itot*V;
disp("Watts",P,"Power drawn from the source");
```

Scilab code Exa 1.10 To find voltage divided among four resistances in series

```
V=100;           // Assigning values to the parameters
R1=5;
R2=10;
R3=15;
R4=20;
Req=R1+R2+R3+R4;   //Equivalent resistance
V1=R1*V/Req;
V2=R2*V/Req;
V3=R3*V/Req;
V4=R4*V/Req;
disp("Ohms",Req,"Equivalent resistance");
disp("Volts",V1,"Voltage across 5 Ohms resistor");
disp("Volts",V2,"Voltage across 10 Ohms resistor");
disp("Volts",V3,"Voltage across 15 Ohms resistor");
disp("Volts",V4,"Voltage across 20 Ohms resistor");
```

Scilab code Exa 1.11 To determine the current divided among three resistors in parallel

```
Itot=12;                  //Assigning values to parameters
R1=4;
R2=12;
R3=6;
Req=1/((1/R1)+(1/R2)+(1/R3));         //Equivalent resistance
V=Itot*Req;
I1=V/R1;
I2=V/R2;
I3=V/R3;
disp("Volts",V,"Potential Difference across the parallel circuit");
disp("Amperes",I1,"Current through 4 Ohm resistor")
disp("Amperes",I2,"Current through 12 Ohm resistor")
disp("Amperes",I3,"Current through 6 Ohm resistor")
```

Scilab code Exa 1.12 To calculate value of an unknown resistor and find the power absorbed by the circuit

```
I=5;                  //Assigning values to the parameters
I1=2;
R2=6;
I2=I-I1;
V=R2*I2;
R1=V/I1;
P=I1*I1*R1+I2*I2*R2;
disp("Ohms",R1,"Value of R1")
disp("Watts",P,"Power absorbed by the circuit")
```

Scilab code Exa 1.13 To calculate the effective resistance of a circuit

```
R1=8;                            // Assigning values to
    resistors
R2=6;
R3=3;
R4=18;
R5=5;
R=1/((1/R2)+(1/R3));            //simplifying the
    network
Rs1=R+R4;
Rs2=1/((1/Rs1)+(1/R5));
Rs3=R1+Rs2;
V=60;
I=V/Rs3;                        // Current through the
    simplified network
disp("Amperes",I,"Current through 8 Ohm resistor");
```

Scilab code Exa 1.14 To find the reading of an Ammeter in the circuit

```
R1=1;                           // Assigning values to
    resistors
R2=2;
R3=1;
R4=1;
R=R3+R4;                        // Simplifying the network
Req=1+(1/((1/R2)+(1/R)));
V=100;
I=V/Req;
I2=I*(R/(R+R2));
disp("Amperes",I2,"Ammeter reading")
```

Scilab code Exa 1.15 To calculate effective resistance

```
R1=1;                    // Assigning values to the
    parameters
R2=5;
R3=4;
R4=8;
R5=6;
R6=2;
R=R1+R2;                //series connection
Ra=R5+R6;
Rb=1/((1/R4)+(1/Ra)) ;
Rc=R3+Rb;
Req=1/((1/R)+(1/Rc));
disp("Ohms",Req,"Effective resistance");
```

Scilab code Exa 1.16 To calculate battery current and effective resistance of the network

```
V=24;                            //Assigning values to
    parameters
R1=4;
R2=8;
R3=6;
R4=12;
Ra=1/((1/R1)+(1/R4));          // Simplifying the
    network
Rb=1/((1/R2)+(1/R3));
Rc=1/((1/Ra)+(1/Rb));
I=V/Rc;
disp("Amperes",I,"Battery current")
```

Scilab code Exa 1.17 To calculate battery current

```
R1=15;                              //Assigning values to parameters
R2=6;
R3=30;
R4=3;
R5=4;
V=10;
Ra=R1+R2;                          // Simplifying the circuit
Rb=R3+R4;
Rc=1/((1/Ra)+(1/Rb));
Req=Rc+R5;
I=V/Req;
disp("Amperes",I,"Battery current")
```

Scilab code Exa 1.18 To calculate effective resistance

```
R1=15;                                  //Assigning parameters
R2=6;
R3=4;
R4=30;
R5=3;
Ra=1/((1/R2)+(1/R5));                  // Simplifying the circuit
Rb=R3+Ra;
Rc=1/((1/R1)+(1/R4));
Req=Rb+Rc;
disp("Ohms",Req,"Effective resistance")
```

Scilab code Exa 1.19 To calculate battery current

```
V=30;                              //Assignign values to
   parameters
Rcf=2;
Ref=2;
Rec=2.4;
Rbc=2;
Rac=4;
Rae=2;
Rab=2;
Rad=2;
Red=1;
Rc=Rab+Rbc;                       // Simplifying the network
Re=Rcf+Ref;
Ra=1/((1/Rac)+(1/Rc));
Re1=1/((1/Re)+(1/Rec));
Ra1=Ra+Re1;
Re2=1/((1/Rae)+(1/Ra1));
Rd=Red+Re2;
Req=1/((1/Rd)+(1/Rad));
I=V/Req;                           // Calculation of battery
    current
disp("Ohms",Req,"Effective resistance")
disp("Amperes",I,"Battery current")
```

Scilab code Exa 1.20 To calculate effective resistance

```
R1=4;                              //Assigning values to
   parameters
R2=6;
R3=8;
R4=2;
Ra=1/((1/R1)+(1/R2));             // Simplifying the
   network
Rb=1/((1/R3)+(1/R4));
Req=Ra+Rb;
```

```
disp("Ohms",Req,"Effective resistance")
```

Scilab code Exa 1.21 To calculate effective resistance

```
R1=5;                          //Assigning values to
   resistors
R2=15;
R3=10;
R4=10;
R5=40;
R6=30;
R7=20;
R8=8;
Rc=R2+R3;                      //Simplifying the network
Re=R4+R5;
Rf=R6+R7;
R=1/((1/Re)+(1/Rf));
Rd=1/((1/R)+(1/Rc));
Req=Rd+R1+R8;
disp("Ohms",Req,"Effective resistance");
```

Scilab code Exa 1.22 To find the value of resistance

```
V=20;                      //Assigning values to
   different parameters
I=1.5;
R1=10;
R2=15;
R3=15;
V10=R1*I;
Vab=V-V10;
I1=Vab/R2;
I2=Vab/R3;
```

```
I3=I-I1-I2;
R=Vab/I3;
disp("Ohms",R,"Value of unknown resistance");
```

Scilab code Exa 1.23 To find the value of resistance

```
P=36;                      //Assigning values to different parameters
V=60;
R1=12;
R2=18;
R3=36;
I1=sqrt(P/R1);
V12=I1*R1;
Vr=V-V12;
I2=V12/R2;
I3=V12/R3;
I=I1+I2+I3;
R=Vr/I;
disp("Ohms",R,"Value of unknown resistance");
```

Scilab code Exa 1.24 To find current and voltages

```
R1=4;                      //Assigning values to parameters
R2=9;
R3=18;
R4=2;
R5=7;
R6=15;
V=125;
R7=(R2*R3)/(R2+R3);
Ra=R7+R1;
```

```
Rb=R5+R4;
R=(1/((1/Ra)+(1/Rb)))+R6;
I=V/R;
I1=(Rb/(Ra+Rb))*I;
IR3=I1*Rb/(Rb+R3);
VR3=IR3*R3;
I2=I-I1;
P4=I2*I2*R5;
disp("Amperes",I,"Current in 15 Ohm resistor");
disp("Amperes",IR3,"Current in 18 Ohm resistor")
disp("Volts",VR3,"Voltage across 18 Ohm resistor");
disp("Watts",P4,"Power dissipated in 7 Ohm resistor"
    );
```

Scilab code Exa 1.26 To find current in 4 Ohm resistor using Source transformation

```
I1=5;                              //Assigning values to
    parameters
R1=2;
V1=6;
I2=2;
R2=4;
V2=I1*R1;                          //Performing source
    transformation
V=V2-V1;
I3=V/R1;
I=I3+I2;
IR2=I*R1/(R1+R2);
disp("Amperes",IR2,"Current in 4 ohm resistor using
    source transformation");
```

Scilab code Exa 1.27 To find current in 3 Ohm resistor using Source transformation

```
V1=6;                                   //Assigning values
    to parameters
R1=2;
R2=6;
R3=2;
I1=3;
R4=1;
R5=3;
I2=V1/R1;                               //Performing source
    transformation
R6=(R2*R3)/(R2+R3);
V2=I2*R6;
R7=R6+R1;
I3=V2/R7;
I4=I1+I3;
IR5=I4*R7/(R7+R4+R5);
disp("Amperes",IR5,"Current in 3 Ohm resistor using
   source transformation")
```

Scilab code Exa 1.28 To find current in 10 Ohm resistor using Source transformation

```
R1=4;                               //Assigning values to
    parameters
V1=7;
R2=2;
R3=4;
I1=8;
R4=6;
R5=9;
V2=12;
R6=10;
```

```
I2=V1/R1;                    //Performing source
    transformation
V3=I1*R2;
I3=V2/R5;
R7=R2+R3;
I4=V3/R7;
R=1/((1/R1)+(1/R7)+(1/R4)+(1/R5));
I=I2+I3-I4;
V=I*R;
IR6=V/(R+R6)
disp("Amperes",IR6,"Current in 10 Ohm resistor using
     source transformation");
```

Scilab code Exa 1.29 To find branch currents using Kirchoff laws

```
R1=3;                        //Assigning values to
    parameters
R2=2;
R3=4;
V1=35;
V2=40;
A=[5,2;3,-4]                 //Matrix of I1,I2 by KVL
    equations
B=[35;-5]
[I]=inv(A)*B                 // I matrix has I1 and I2
    values
disp("Amperes",I(1,1),"Current in 3 ohm resistor");
disp("Amperes",I(2,1),"Current in 4 ohm resistor");
I3=I(1,1)+I(2,1)
disp(,"Amperes",I3,"Current in 2 ohm resistor");
```

Scilab code Exa 1.30 To find branch currents using Kirchoff laws

```
R1=2;                          //Assigning values to
    parameters
R2=3;
R3=4;
R4=5;
R5=1;
A=[3,-3;9,12]                //Matrix of I1,I2 by KVL
    equations
B=[2;4]
[I]=inv(A)*B                // I matrix has I1 and I2
    values
disp("Amperes",[I],"Current in 1 Ohm resistor:Row 1
    and Column 1, Current in 3 Ohm resistor:Row 2,
    Column 1");
IR1=1-I(1,1);
IR3=1-I(1,1)-I(2,1);
IR4=I(1,1)+I(2,1)
disp("Amperes",IR1,"Current in 2 Ohm resistor");
disp("Amperes",IR3,"Current in 4 Ohm resistor");
disp("Amperes",IR4,"Current in 5 Ohm resistor");
```

Scilab code Exa 1.31 To determine the current supplied by the battery

```
A=[1,-5,3;5,-1,-9;7,1,-5]              //Matrix of I1,
    I2,I3 Coeffecients by KVL equations
B=[0;0;1];
[I]=inv(A)*B
disp("Amperes",I(1,1)+I(2,1),"Current supplied by
    the battery");
```

Scilab code Exa 1.32 To determine current through 20 Ohm resistor

```
A=[0,6,-2;3,4,1;1,2,-4]            //Matrix of I1,I2,
    I3 Coeffecients by KVL equations
B=[9;24;-4];
[I]=inv(A)*B;
disp("Amperes",I(2,1),"Current in 20 Ohm resistor");
```

Scilab code Exa 1.38 To find equivalent resistance between the terminals X and Y

```
R1=2;                          //Assigning values to
    parameters
R2=2;
R3=4;
R4=6;
R5=6;
R6=2;
R7=7;
Ra=R6*R3/(R3+R5+R6);           //Converting Delta to
    Star
Rb=R5*R6/(R3+R5+R6);
Rc=R3*R5/(R3+R5+R6);
R8=Rc+R4;
R9=Rb+R7;
R10=(R8*R9)/(R8+R9);
R=R1+R2+Ra+R10;
disp("Ohms",R,"Equivalent resistor of the network
    using Star-Delta transformation")
```

Scilab code Exa 1.40 To find current I in the network

```
R1=6;                //Assigning values to parameters
R2=8;
R3=5;
```

```
R4=10;
R5=5;
R6=10;
R7=15;
V=100;
Rx=R3+R6+(R3*R6)/R4;        //Converting Star to Delta
Ry=R4+R6+(R4*R6)/R3;
Rz=R3+R4+(R3*R4)/R6;
Ra=(R5*Rx)/(Rx+R5);
Rb=(Ry*R7)/(Ry+R7);
Rl=(R1*R2)/(R1+R2+Rz);      //Converting Delta to Star
Rm=(R1*Rz)/(R1+R2+Rz);
Rn=(R2*Rz)/(R1+R2+Rz);
R8=Ra+Rm;
R9=Rb+Rn;
R10=(R8*R9)/(R8+R9);
R=R10+Rl;
I=V/R;
disp("Amperes",I,"Current in the circuit");
```

Scilab code Exa 1.41 To find equivalent resistance between terminals X and Y

```
R1=8;                            //Assigning values to
    parameters
R2=4;
R3=12;
R4=12;
R5=34;
R6=30;
R7=30;
R8=17;
R9=13;
R10=R1+R2;
R11=R8+R9;
```

```
Ra=(R10*R3)/(R3+R4+R10);          //Converting Delta to Star
Rb=(R3*R4)/(R3+R4+R10);
Rc=(R10*R4)/(R3+R4+R10);
Rx=(R6*R7)/(R6+R7+R11);          //Converting Delta to Star
Ry=(R7*R11)/(R6+R7+R11);
Rz=(R6*R11)/(R6+R7+R11);
Rl=R5+Ra+Rx;
Rm=Rc+Ry;
Rn=(Rl*Rm)/(Rl+Rm);
Req=Rb+Rz+Rn;
disp("Ohms",Req,"Equivalent resistance of the network");
```

Scilab code Exa 1.42 To find equivalent resistance between the terminals A and B

```
R1=6;                            //Assigning values to parameters
R2=6;
R3=3;
R4=12;
R5=12;
R6=12;
R7=3;
Ra=(R4*R5)/(R4+R5+R6);          //Converting Delta to Star
Rb=(R4*R6)/(R4+R5+R6);
Rc=(R5*R6)/(R4+R5+R6);
Rd=R3+Rb;
Re=R7+Rc;
Rf=(R1*R2)/(R1+R2);
Rh=(Rd*Re)/(Rd+Re);
Req=Ra+Rf+Rh;
```

```
disp("ohms",Req,"Equivalent resistance of the network");
```

Scilab code Exa 1.43 To find equivalent resistance between the terminals A and B

```
R1=6;                                   //Assigning values to parameters
R2=4;
R3=3;
R4=5;
R5=5;
R6=2;
R7=4;
Rx=R3+R4+(R3*R4)/R6;                    //Converting Star to Delta
Ry=R4+R6+(R4*R6)/R3;
Rz=R3+R6+(R3*R6)/R4;
disp(Rx)
disp(Ry)
disp(Rz)
Ra=(R5*Rz)/(R5+Rz);
Rb=(R7*Ry)/(R7+Ry);
Rl=(R1*R2)/(R1+R2+Rx);                  //Converting Delta to Star
Rm=(R2*Rx)/(R1+R2+Rx);
Rn=(R1*Rx)/(R1+R2+Rx);
Rp=Ra+Rn;
Rq=Rb+Rm;
Rr=(Rp*Rq)/(Rp+Rq);
Req=Rl+Rr;
disp("Ohms",Req,"Eqivalent resistance of the network");
```

Scilab code Exa 1.44 To find current in 1 Ohm resistor using Mesh analysis

```
A=[-6,3;3,-10.5]                //Matrix of I1,I2
    Coeffecients by Mesh analysis
B=[-12.5;0];
[I]=inv(A)*B;
disp("Amperes",I(1,1),"Current in 1 Ohm resistor");
```

Scilab code Exa 1.45 To find I1 I2 I3 using Mesh analysis

```
A=[7,-1,0;1,-6,3;0,3,-4]            //Matrix of I1,I2
    ,I3 Coeffecients by Mesh analysis
B=[17;-25;19];
[I]=inv(A)*B;
disp("Amperes",I(1,1),"I1");
disp("Amperes",I(2,1),"I2");
disp("Amperes",I(3,1),"I3");
```

Scilab code Exa 1.47 To find current through 2 Ohm resistor using Mesh analysis

```
I1=6;
R1=1;
R2=2;
R3=5;
V=10;
I2=(2*I1-10)/7;
IR2=(I1-I2);
disp("Amperes",IR2,"Current in 2 Ohm resistor")
```

Scilab code Exa 1.48 To find current in 100 Ohm resistor using Mesh analysis

```
V1=60;
R1=20;
I=1;
R2=30;
R3=50;
V2=40;
R4=100;
A=[-1,1,0;-20,-80,50;0,50,-150]               //Matrix
    of I1,I2,I3 Coeffecients by Mesh analysis
B=[1;-20;-40];
[I]=inv(A)*B;
disp("Amperes",I(3,1),"Current in 100 Ohm resistor")
    ;
```

Scilab code Exa 1.49 To find current in 5 Ohm resistor using Mesh analysis

```
V=50;
R1=10;
R2=5;
R3=3;
R4=2;
R5=1;
I=2;
A=[0,1,-1;15,-12,-6;-15,10,5]               //Matrix of
    I1,I2,I3 Coeffecients by Mesh analysis
B=[2;0;-50];
[I]=inv(A)*B;
```

```
disp("Amperes",(I(1,1)-I(3,1)),"Current in 5 Ohm
    resistor");
```

Scilab code Exa 1.50 To find current through 15 Ohm resistor using Nodal analysis

```
R1=20;
R2=10;
R3=15;
R4=10;
R5=10;
V1=100;
V2=80;
A=[13,-4;1,-4];                    //Applying KCL at the two
    nodes
B=[300;120]
V=inv(A)*B;
IR3=(V(1,1)-V(2,1))/R3;
disp("Amperes",IR3,"Current in 15 Ohm resistor");
```

Scilab code Exa 1.51 To find currents I1 I2 I3 using Nodal analysis

```
R1=0.2;
R2=0.3;
R3=0.1;
V1=120;
V2=110;
A=[5,-2;1,-4];                          //Applying KCL at the
     two nodes
B=[358.2;-324];
V=inv(A)*B;
I1=(120-V(1,1))/R1;
I2=(V(1,1)-V(2,1))/R2;
```

```
I3=(110-V(2,1))/R3;
disp("Amperes",I1,"Current I1")
disp("Amperes",I2,"Current I2")
disp("Amperes",I3,"Current I3")
```

Scilab code Exa 1.52 To determine voltages at A and B using Nodal Analysis

```
R1=2;
R2=4;
R3=4;
R4=2;
I1=2;
I2=4;
A=[2,-1;1,-3];                    //Applying KCL at the
    two nodes
B=[8;-16];
V=inv(A)*B;
disp("Volts",V(1,1),"Voltage at node A")
disp("Volts",V(2,1),"Voltage at node B")
```

Scilab code Exa 1.53 To find current in 2 Ohm and 3 Ohm resistor using Nodal analysis

```
R1=2;
R2=10;
R3=5;
R4=15;
I1=1/3;
R5=3;
V1=10;
V2=18;
```

```
A=[8,-2;3,-9];                    //Applying KCL at the two nodes
B=[50;-85];
V=inv(A)*B;
I1=(V1-V(1,1))/R1;
I5=(V(2,1)-V2)/R5;
disp("Amperes",I1,"Current in 2 Ohm resistor");
disp("Amperes",I5,"Current in 3 Ohm resistor");
```

Scilab code Exa 1.54 To find currents in various resistors

```
R1=2;                                                  //Assigning values to parameters
R2=10;
R3=2;
R4=5;
R5=1;
R6=4;
I1=28;
I2=2;
A=[11,-5,-1;5,-17,10;1,10,-13.5];                      //Applying KCL at the two nodes
B=[280;0;20];
V=inv(A)*B;
I1=V(1,1)/R1;
I2=(V(1,1)-V(2,1))/R3;
I3=(V(1,1)-V(3,1))/R2;
I4=(V(2,1)-V(3,1))/R5;
I5=V(2,1)/R4;
I6=V(3,1)/R6;
disp("Amperes",I1,"Current I1")
disp("Amperes",I2,"Current I2")
disp("Amperes",I3,"Current I3")
disp("Amperes",I4,"Current I4")
disp("Amperes",I5,"Current I5")
```

```
disp("Amperes",I6,"Current I6")
```

Scilab code Exa 1.55 To find different branch currents using Superposition theorem

```
V1=35;                               //Assigning values to parameters
R1=3;
R2=2;
R3=4;
V2=40;
Ra=((R2*R3)/(R2+R3))+R1;          // Considering only 35V source
I=V1/Ra;
IR1=I;
IR3=I*(R2)/(R2+R3);
IR2=I-IR3;
Rb=((R1*R2)/(R1+R2))+R3;         //Considering only 40V source
I1=V2/Rb;
I1R3=I1;
I1R1=I1*(R2)/(R2+R3);
I1R2=I1-I1R1;
Ires3=IR1-I1R1;                  // Adding the currents algebraically
Ires2=IR2+I1R2;
Ires4=I1R3-IR3;
disp("Amperes",Ires3,"Current in 3 Ohm resistor using Superposition Theorem");
disp("Amperes",Ires2,"Current in 2 Ohm resistor using Superposition Theorem");
disp("Amperes",Ires4,"Current in 4 Ohm resistor using Superposition Theorem");
```

Scilab code Exa 1.56 To find current in 1 Ohm resistor using Superposition theorem

```
I1=1;                              //Assigning values to parameters
R1=3;
R2=2;
R3=2;
R4=2;
R5=1;
Ra=(R1*R2)/(R1+R2);
Rb=(R3*R4)/(R3+R4);
Iab=(I1*Ra)/(Ra+Rb+R5);
A=[5,0,-2;0,4,-2;2,2,-5];    //Current coeffecients by applying KVL
B=[-1;1;0];
I=inv(A)*B;
IR5=I(3,1)+Iab;
disp("Amperes",IR5,"Current in 1 Ohm resistor");
```

Scilab code Exa 1.57 To determine current in 20 Ohm resistor using Superposition theorem

```
V1=10;                             //Assigning values to parameters
R1=10;
R2=1;
V2=8;
R3=8;
V3=12;
R4=20;
```

```
I20=V1/(R2+R4);                           // Considering only
   10V source
Ia20=V3/(R2+R4);                          // Considering only
   12V source
Ib20=V2/(R2+R4);                          // Considering only 8
   V source
I=Ia20+Ib20-I20;                          // Adding the
   currents algebraically
disp("Amperes",I,"Current through 20 Ohm resistor
   using Superposition principle")
```

Scilab code Exa 1.58 To determine current in 1 Ohm resistor using Superposition theorem

```
V1=4;                                        //Assigning values
    to parameters
R1=2;
I1=1;
R2=1;
R3=3;
I2=3;
I1a=V1/(R1+R2);                             //Considering the
   current flow due to 4V voltage source
I1b=(I2*R1)/(R1+R2);                        //Considering the
   current flow due to 3A current source
I1c=(I1*R1)/(R2+R1);                        //Considering the
   current flow due to 1A current source
I=I1a+I1b+I1c;
disp("Amperes",I,"Current in 1 Ohm resistor using
   Superposition principle");
```

Scilab code Exa 1.59 To determine current in 5 Ohm resistor using Superposition theorem

```
V1=50;                              //Assigning values to
    parameters
V2=36;
R1=5;
R2=20;
R3=10;
I1=4;
R4=(R2*R3)/(R2+R3);
R5=R4+R1;
I5a=V1/R5;                          //Considering only 50V
    source
I5b=I1*(R4/(R4+R1));                //Considering only 4
   A current source
I2=V2/R3;                           //Converting 36V
   voltage source to 3.6A current source using
   source transformation
I5c=I2*(R4/(R4+R1));                //Considering only
   3.6A current source
I=(I5b+I5c)-I5a;                    //Adding the
   currents algebraically
disp("Amperes",I,"Current through 5 Ohm resistor
   using Superposition principle");
```

Scilab code Exa 1.60 To determine current in 10 Ohm resistor using Superposition theorem

```
V1=80;                              //Assigning values
   to parametrs
V2=20;
I1=20;
R1=5;
R2=10;
R3=50;
R4=20;
R5=(R3*R4)/(R3+R4);
```

```
I10a=V1/(R1+R2+R5);               //Considering only 80V
     voltage source
I2=V2/R4;                         //Converting 20V
    voltage source to 1A current source
I10b=(I2*R5)/(R1+R2+R5);          //Considering only 1A
    current source
I10c=(I1*R1)/(R1+R2+R5);          //Considering only 20A
     current source
I=I10b+I10c-I10a;                    //Adding the
    currents algebraically
disp("Amperes",I,"Current through 5 Ohm resistor
    using Superposition principle");
```

Scilab code Exa 1.61 To determine current through 5 Ohm resistor using Thevenin theorem

```
V1=10;                            //Assigning values to
    parameters
V2=20;
R1=6;
R2=1;
R3=2;
R4=3;
R5=5;
A=[7,-1;1,-6];                //Mesh current coeffecients
B=[10;0]
I=inv(A)*B;
Vth=V2+R4*I(2,1);             //Calculation of Thevenin
    vlotage
Ra=(R1*R2)/(R1+R2);
Rb=Ra+R3;
Rth=(R4*Rb)/(R4+Rb);        //Calculation of Thevenin
    current
Il=Vth/(R5+Rth);
disp("Amperes",Il,"Current in 5 Ohm resistor using
```

```
Thevenin theorem");
```

Scilab code Exa 1.62 To determine current using Thevenin theorem

```
R1=1.5;                              //Assignig values to
    parameters
R2=6;
R3=5;
R4=7.5;
R5=9;
V1=6;
V2=30;
A=[-22.5,7.5;7.5,-12.5];       //Current coeffecients
B=[0;30];
I=inv(A)*B;
Vth=(V1+R3*I(2,1)+R2*I(1,1))*-1;    //Thevenin
   voltage
Ra=(R3*R4)/(R4+R3);
Rb=Ra+R2;
Rth=(Rb*R5)/(R5+Rb);                //Thevenin
   resistance
Il=Vth/(R1+Rth);
disp("Amperes",Il,"Current in 1.5 Ohm resistor");
```

Scilab code Exa 1.63 To determine current through 8 Ohm resistor using Thevenin theorem

```
V1=2;
V2=4;
R1=5;
R2=10;
R3=10;
R4=8;
```

```
R5=5;
A=[-15,10;10,-25];
B=[-2;4];
I=inv(A)*B;
Vth=V2+R1*I(2,1);
Ra=(R1*R2)/(R1+R2);
Rb=Ra+R3;
Rth=(Rb*R5)/(Rb+R5);
Il=Vth/(R4+Rth);
disp("Amperes",Il,"Current in 8 Ohm resistor");
```

Scilab code Exa 1.64 To determine current in 10 Ohm resistor by Thevenin Theorem

```
R1=8;                              //Assigning values to
    parameters
R2=4;
R3=12;
R4=12;
R5=34;
R6=30;
R7=30;
R8=17;
R9=13;
V=180;
R10=R1+R2;
R11=R8+R9;
Ra=(R10*R3)/(R3+R4+R10);           //Converting Delta to
    Star
Rb=(R3*R4)/(R3+R4+R10);
Rc=(R10*R4)/(R3+R4+R10);
Rx=(R6*R7)/(R6+R7+R11);           //Converting Delta to
   Star
Ry=(R7*R11)/(R6+R7+R11);
Rz=(R6*R11)/(R6+R7+R11);
```

```
Rp=R5+Ra+Rx;
Rm=Rc+Ry;
Rn=(Rp*Rm)/(Rp+Rm);
Rth=Rb+Rz+Rn;
I=V/(Rp+Rc+Rz);
Vth=Rp*I
Rl=10;
Il=Vth/(Rl+Rth);
disp("Amperes",Il,"Current in 10 Ohm load using
    Thevenin theorem is")
```

Scilab code Exa 1.65 To obtain power drawn by 20 Ohm resistor using Thevenin Theorem

```
V1=12;                            //Assigning values to
    parameters
V2=8;
I1=4;
R1=2;
R2=10;
R3=20;
R4=5;
R5=15;
R6=25;
R7=5;
A=[1,-1,0;-12,-20,15;0,15,-45];    //Current
    coeffecients
B=[4;-12;8];
I=inv(A)*B;
Vth=V1-R1*I(1,1)-R2*I(1,1);      //Thevenin voltage
Ra=R1+R2;
Rb=R6+R7;
Rc=(R5*Rb)/(R5+Rb);
Rd=R4+Rc;
Rth=(Ra*Rd)/(Ra+Rd);             //Thevenin resistance
```

```
Il=Vth/(R3+Rth);
P=Il*Il*R3;
disp("Watts",P,"Power drawn by 20 Ohm resistor");
```

Scilab code Exa 1.66 To determine current in 30 Ohm resistor using Thevenin Theorem

```
V1=150;                    //Assigning values to parameters
V2=50;
I1=13;
R1=15;
R2=60;
R3=40;
R4=30;
A=[-1,1;-15,-100];         //Current coeffecients
B=[13;-150];
I=inv(A)*B;
Vth=-V2+R3*I(2,1);         //Thevenin voltage
Ra=R1+R2;
Rth=(R3*Ra)/(R3+Ra);       //Thevenin resistance
Il=Vth/(R4+Rth);
disp("Amperes",Il," Current flowing in 20 Ohm resistor");
```

Scilab code Exa 1.67 To find current in Rl using Thevenin Theorem

```
V=100;                                        //Assigning values to parameters
R1=20;
R2=80;
R3=40;
R4=50;
```

```
I1=V/(R1+R2);
I2=V/(R3+R4);
Vth=R3*I2-R1*I1;                                //Calculating Thevenin voltage
Rth=((R1*R2)/(R1+R2))+((R3*R4)/(R3+R4));       //Calculating Thevenin resistance
Rl=5;
Il=Vth/(Rth+Rl);                               //Calculating Thevenin current
Rla=10;
Ila=Vth/(Rth+Rla);
Rlb=20;
Ilb=Vth/(Rth+Rlb);
disp("Amperes",Il,"Current in 5 Ohm load");
disp("Amperes",Ila,"Current in 10 Ohm load");
disp("Amperes",Ilb,"Current in 20 Ohm load");
```

Scilab code Exa 1.68 To find current in 40 Ohm resistor using Thevenin Theorem

```
R1=10;                      //Assigning values to parameters
R2=20;
R3=40;
R4=30;
R5=15;
V=2;
I1=V/(R1+R4);
I2=V/(R2+R5);
Vth=R2*I2-R1*I1;            //Calculation of Thevenin voltage
Rth=((R1*R4)/(R1+R4))+((R2*R5)/(R2+R5));    //Calculation of Thevenin resistance
Il=Vth/(Rth+R3);
disp("Amperes",Il,"Load current")
```

Scilab code Exa 1.69 To find current through 20 Ohm resistor using Norton theorem

```
R1=10;                          //Assigning values to
   parameters
R2=10;
R3=15;
R4=20;
V=100;
A=[-20,10;10,-25]              //Current coeffecients by
   KVL equations
B=[-100;0];
I=inv(A)*B;
IN=I(2,1);                     //Norton's current
RN=(R1*R2)/(R1+R2)+R3;         //Norton's resistance
Il=(IN*RN)/(RN+RN)
disp("Amperes",Il,"Current in load of 20 Ohm
   resistor using Norton theorem ")
```

Scilab code Exa 1.70 To find current in 4 Ohm resistor using Norton Theorem

```
I1=5;                          //Assigning values to
   parameters
I2=2;
V1=6;
R1=2;
R2=4;
I1=5;
I2=(R1*I1-6)/R1;
I3=I2+2;
```

```
IN=I3;                    //Calculation of Norton
    current
RN=R1;                    //Calculation of Norton
    resistance
Il=IN*RN/(RN+R2);         //Calculation of load current
    using Norton theorem
disp("Amperes",Il,"Current in 4 Ohm resistor by
    Norton theorem");
```

Scilab code Exa 1.71 To find current in 4 Ohm resistor using Norton Theorem

```
I1=6;                                 //Assigning values
     to parameters
V1=10;
V2=24;
R1=2;
R2=1;
R3=10;
R4=3;
R5=2;
R6=4;
A=[-13,10,1;10,-15,3;1,3,-4];    //Current
    coefficients using KVL equations
B=[-12;10;-24];
I=inv(A)*B;
IN=I(3,1);                        //Norton current
Rx=R2+R3+(R2*R3)/R4;             //Converting Star to
    Delta
Ry=R3+R4+(R3*R4)/R2;
Rz=R2+R4+(R2*R4)/R3;
Ra=(R1*Rx)/(R1+Rx);
Rb=(Ry*R5)/(Ry+R5);
Rc=Ra+Rb;
RN=(Rz*Rc)/(Rz+Rc);           //Norton resistance
```

```
Il=(IN*RN)/(R6+RN);
disp("Amperes",Il,"Current in 4 Ohm resistor using
   Nortonn Theorem")
```

Scilab code Exa 1.72 To find current in 5 Ohm resistor using Norton theorem

```
I1=6;                              //Assigning values
    to parameters
I2=2;
V=10;
V2=24;
R1=3;
R2=5;
R3=6;
R4=2;
R5=10;
R6=6;
R7=4;
R8=3;
A=[1,0,0;0,-18,10;0,10,-23;];    //Current
   coefficients using KVL equations
B=[6;-10;12];
I=inv(A)*B;
IN=I(1,1)-I(2,1);
   //Norton current
RN=((R5*(R6+R7+R8))/(R5+R6+R7+R8))+R3+R4;          //
   Norton resistance
Il=(IN*RN)/(R2+RN);
disp("Amperes",Il,"Current in 4 Ohm resistor using
   Nortonn Theorem")
```

Scilab code Exa 1.73 Calculation of RL for it to absorb maximum power using maximum power Transfer Theorem

```
V=120;                          //Assigning values to parameters
R1=40;
R2=20;
R3=60;
Rth=((R1*R2)/(R1+R2))+R3; //Calculation of Thevenin Resistance
Rl=Rth;                       //For maximum power,load resistance should be equal to Thevenin resistance
I=V/(R1+R2);                  //Calculation of Circuit Current
Vth=R2*I;                     //Calculation of Thevenin Voltage
Pmax=(Vth*Vth)/(4*Rth);      //Calculation of Maximum Power
disp("Watts",Pmax,"Maximum power by Maximum Power transfer theorem");
```

Scilab code Exa 1.74 To find magnitude of Rl using Maximum Power transfer theorem

```
V=10;
I=6;
R1=5;
R2=2;
R3=3;
R4=4;
Rth=((R1*R2)/(R1+R2))+R3+R4;
A=[-1,1;-5,-2];     //Current coefficients using KVL equations
B=[6;-10];
I=inv(A)*B;
```

```
Vth=R2*I(2,1);
Pmax=(Vth*Vth)/(4*Rth);
disp("Watts",Pmax,"Maximum Power");
```

Scilab code Exa 1.75 To determine maximum power delivered to Rl

```
V=30;                              //Assigning
    values to parameters
I1=25;
I2=10;
R1=5;
R2=10;
R3=2;
R4=10;
Rth=((R3*(R1+R2))/(R3+R1+R2))
A=[-1,1,0;-15,-12,10;0,10,-10];    //Current
    coefficients using KVL equations
B=[10;-125;30];
I=inv(A)*B;
Vth=V+R3*I(2,1);
Pmax=(Vth*Vth)/(4*Rth);
disp("Watts",Pmax,"Maximum Power");
```

Scilab code Exa 1.76 Calculation of RL for it to absorb maximum power using maximum power Transfer Theorem

```
R1=2;                    //Assigning values to
    parameters
R2=4;
R3=1;
R4=5;
R5=8;
V=50;
```

```
Ra=(R1*R2)/(R1+R2+R4);    //Converting Delta to Star
Rb=(R1*R4)/(R1+R2+R4);
Rc=(R2*R4)/(R1+R2+R4);
Rm=R3+Ra;
Rn=Rb+R5;
Rth=Rc+((Rm*Rn)/(Rm+Rn)); //Calculating Thevenin
    resistance
Rl=Rth;
Rp=R2+R4;
Rq=R3+R5;
Rr=(Rp*Rq)/(Rp+Rq);
I=V/(R1+Rr);
I1=I*Rp/(Rp+Rq);
I2=I*Rq/(Rp+Rq);
Vth=R3*I2-R2*I1;          //Calculating Thevenin
    voltage
Pmax=(Vth*Vth)/(4*Rth); //Calculating Maximum Power
disp("Watts",Pmax,"Maximum Power");
```

Chapter 2

AC Circuits

Scilab code Exa 2.1 To find parameters of an alternating current

```
t=3*10^-3;                          //Assigning values to
    parameters
w=314;
Im=141.4*sin(%pi/2);
f=w/(2*%pi);
T=1/f;
t=3*(10^-3);
i=141.4*sin(w*t);
disp("Amperes",Im,"Maximum value of current");
disp("Hertz",f,"Frequency");
disp("Seconds",T,"Time period");
disp("Amperes",i,"Instantaneous value of current at
    t=3 msec");
```

Scilab code Exa 2.2 To find parameters of an alternating current

```
f=60;                   //Assigning values to parameters
Im=12;
```

```
i=Im*sin(377/360)
disp("Amperes",i,"Current at t=1/360 sec")
i1=9.6;
t=asin(i1/Im)/377;
disp("Seconds",t,"Time taken to reach i1=9.6");
```

Scilab code Exa 2.3 To find time taken by an alternating voltage to reach 0

```
w=942;              //Assigning values to parameters
Vm=10;
V=6;
t=asin(V/Vm)/w;
f=w/(2*%pi);
T=1/f;
t2=t+T;
disp("Seconds",t2,"Time taken to reach 6V second
    time");
```

Scilab code Exa 2.4 To find average value of a waveform

```
function y=f(t),y=20*sin(t),endfunction      //
    defining the voltage function
T=2*%pi;
Res=intg(0,%pi,f)/(T);
disp("Volts",Res,"Average voltage value");
```

Scilab code Exa 2.5 To find average value of a waveform

```
function y=f(t),y=10*t,endfunction              //
   Defining the current function
T=4;
Res=intg(0,2,f)/(T);
disp("Amperes",Res,"Average current value");
```

Scilab code Exa 2.6 To find average value of a waveform

```
function y=f(t),y=6*t,endfunction               //
   Defining the voltage equation
T=3;
Res=intg(0,3,f)/(T);
disp("Volts",Res,"Average voltage value");
```

Scilab code Exa 2.7 To find average value of a waveform

```
Vm=1;                     //Assuming Vm=1
function y=f(t),y=Vm*sin(t),endfunction              //
   Defining voltage Equation
function y1=f1(t),y1=0.866*Vm*sin(t),endfunction
T=%pi;
Res=((intg(0,%pi/3,f))+(intg(%pi/3,%pi/2,f1))+(intg(
   %pi/2,%pi,f)))/T;
disp("Volts",Res,"Average voltage value");
```

Scilab code Exa 2.8 To find average value of a waveform

```
Vm=1;            Assuming Vm=1;
function y=f(t),y=Vm*sin(t),endfunction          //
   Defining voltage equation
```

```
T=%pi;
Res=intg(%pi/6,%pi,f)/(T);
disp("Volts",Res,"Average voltage value");
```

Scilab code Exa 2.10 To find rms value of a waveform

```
Vm=1;          //Assuming Vm=1
function y=f(t),y=Vm*Vm*sin(t)*sin(t),endfunction
        //Defining Voltage Equation
T=2*%pi;
Res=sqrt(intg(0,%pi,f)/(T));
disp("Volts",Res,"Rms value of voltage");
```

Scilab code Exa 2.11 To find rms value of a waveform

```
Vm=1;               //Assuming Vm=1
function y=f(t),y=Vm*Vm*sin(t)*sin(t),endfunction
        //Defining Voltage Equation
T=2*%pi;
Res=sqrt(intg(%pi/4,%pi,f)/(T));
disp("Volts",Res,"Rms value of voltage");
```

Scilab code Exa 2.12 To find rms value of a waveform

```
Vm=1;              //Assuming Vm=1
function y=f(t),y=Vm*Vm*sin(t)*sin(t),endfunction
        //Defining Voltage Equation
function y1=f1(t),y1=0.866*0.866*Vm*Vm*sin(t)*sin(t)
   ,endfunction
T=%pi;
```

```
Res=sqrt(((intg(0,%pi/3,f))+(intg(%pi/3,%pi/2,f1))+(
    intg(%pi/2,%pi,f)))/T);
disp("Volts",Res,"Rms voltage value");
```

Scilab code Exa 2.13 To find rms value of a waveform

```
Vm=1;              //Assuming Vm=1
function y=f(t),y=10*t*10*t,endfunction           //
    Defining Current Equation
T=4;
Res=sqrt(intg(0,2,f)/(T));
disp("Amperes",Res,"Rms current value");
```

Scilab code Exa 2.14 To find rms value of a waveform

```
Vm=1;                    //Assuming Vm=1
function y=f(t),y=sin(t)*sin(t),endfunction
            //Defining Voltage Equation
T=%pi;
Res=sqrt(intg(%pi/6,%pi,f)/(T));
disp("Volts",Res,"Rms voltage value");
```

Scilab code Exa 2.15 To find rms value of a waveform

```
Vm=1;                   //Assuming Vm=1
function y=f(t),y=sin(t+(%pi/3))*sin(t+(%pi/3)),
    endfunction    //Defining Voltage Equation
T=2*(%pi/3);
Res=sqrt(intg(0,T,f)/(T));
disp("Volts",Res,"Rms voltage value");
```

Scilab code Exa 2.16 To find effective value of resultant current

```
function y=f(t),y=(10+10*sin(t))*(10+10*sin(t)),
   endfunction       //Defining Current Equation
T=2*%pi;
Res=sqrt(intg(0,2*%pi,f)/(T));
disp("Amperes",Res,"Rms current value");
```

Scilab code Exa 2.17 To find parameters of an alternating current

```
Im=62.35;
w=323;
function y=f(t),y=Im*sin(w*t),endfunction        //
   Defining Voltage Equation
fr=w/(2*%pi);
Irms=Im/sqrt(2);
Iavg=0.637*Im;
formfac=Irms/Iavg;
disp("Amperes",Im,"Maximum value of current")
disp("Hertz",fr,"Frequency");
disp("Amperes",Irms,"Rms value of current");
disp("Amperes",Iavg,"Average value of current");
disp(formfac,"Form factor");
```

Scilab code Exa 2.19 To derive instantaneous value of sum and difference of voltages

```
V1=42.43+%i*0;                 //Defining voltage
   equations in rectangular form
```

```
V2=14.14+%i*24.49;
Va=V1+V2;
[Ro,Theta]=polar(Va);
Vm=Ro*sqrt(2);
disp("Volts",Vm,"Maximum value of voltage
    considering addition of voltages")
function y=f(t), y=Ro*sin(t+Theta),endfunction
    //Defining voltage equation
Vb=V1-V2;
[Ro1,Theta1]=polar(Vb);
Vm1=Ro1*sqrt(2);
function y1=f(t),y1=Ro*sin(t+Theta1),endfunction
    //Defining voltage equation
disp("Volts",Vm1,"Maximum value of voltage
    considering difference of voltages")
```

Scilab code Exa 2.21 To find resultant of four alternating voltages

```
V1=17.68              //Defining voltage equations in
    rectangular form
V2=6.12+%i*3.54
V3=%i*21.21
V4=10-%i*10;
V=V1+V2+V3+V4;
[Ro,Theta]=polar(V);
function y=f(t), y=Ro*sqrt(2)*sin(t+Theta),
    endfunction
disp("Volts",Ro*sqrt(2),"Maximum Voltage value")
```

Scilab code Exa 2.22 To calculate an unknown alternating voltage

```
V1=36.75+%i*21.22              //Defining voltage
    equations in rectangular form
```

```
V2=-45.93-%i*26.52
V3=-50+%i*50;
V=-30.59+%i*94.15;
V4=V-(V1+V2+V3);
[Ro,Theta]=polar(V4);
function y=f(t), y=Ro*sqrt(2)*sin(t+Theta),
   endfunction
disp("Volts",Ro*sqrt(2),"Maximum Voltage value")
```

Scilab code Exa 2.23 To find current in wire s

```
I1=2.12+%i*3.67                //Defining current
   equations in rectangular form
I2=-3.07+%i*1.77
I3=-1.84+%i*1.06;
I4=-(I1+I2+I3);
[Ro,Theta]=polar(I4);
function y=f(t), y=Ro*sqrt(2)*sin(t+Theta),
   endfunction
disp("Amperes",Ro*sqrt(2),"Maximum current value")
```

Scilab code Exa 2.24 To find resultant emf across the series connected coils

```
V1=230              //Defining voltage equations in
   rectangular form
V2=-115+%i*200;
V3=-115-%i*200;
V=V1+V2+V3;
[Ro,Theta]=polar(V);
function y=f(t), y=Ro*sqrt(2)*sin(t+Theta),
   endfunction
disp("Volts",Ro*sqrt(2),"Maximum Voltage value")
```

Scilab code Exa 2.25 To find potential difference

```
V1=70.71                    //Defining voltage equations in
    rectangular form
V2=%i*176.78
V3=91.86+%i*53.04
V4=100-%i*100;
V=V1+V2+V3+V4;
[Ro,Theta]=polar(V);
function y=f(t), y=Ro*sqrt(2)*sin(t+Theta),
   endfunction
disp("Volts",Ro*sqrt(2),"Maximum Voltage value with
   V2 polarity as it is")
V=V1-V2+V3+V4;
[Ro1,Theta1]=polar(V);
function y1=f(t), y1=Ro1*sqrt(2)*sin(t+Theta),
   endfunction
disp("Volts",Ro1*sqrt(2),"Maximum Voltage value with
    polarity of V2 reversed")
```

Scilab code Exa 2.26 To find parameters of an AC circuit

```
C=318*10^-6;                //Assignig values to parameters
V=230;
f=50;
Xc=1/(2*%pi*f*C);
I=V/Xc;
Vm=sqrt(2)*V;
Im=sqrt(2)*I;
function y=f(t), y=Vm*sin(2*%pi*f*t),endfunction
function y1=f(t), y1=Im*sin(2*%pi*f*t+%pi/2),
   endfunction
```

```
disp("Volts",Vm,"Peak voltage value");
disp("Amperes",Im,"Peak currnet value");
```

Scilab code Exa 2.27 To obtain voltage across an inductor

```
clc
L=10*10^-3;                    //ASssigning values to parameters
Im=5;
w=2000;
function y=f(t), y=Im*sin(w*t+%pi/2),endfunction
I=Im/sqrt(2);
Xl=2*%pi*L;
Vm=L*Im*w;
Vl=Vm/sqrt(2);
disp("Volts",Vl,"Voltage Vl");
```

Scilab code Exa 2.28 To find voltage and current in the circuit

```
clc
V=150;                    //Assigning values to parameters
f=50;
L=0.2;
Xl=2*%pi*f*L;
Vm=V*sqrt(2);
I=V/Xl;
Im=sqrt(2)*I;
function y=f(t), y=Vm*sin(2*%pi*f*t),endfunction
function y1=f(t), y1=Im*sin(2*%pi*f*t-(%pi/2))
   endfunction
disp("Volts",Vm,"Maximum voltage value");
disp("Amperes",Im,"Maximum current value");
```

Scilab code Exa 2.29 To find parameters of an AC circuit

```
clc
R=7;                    //Assigning values to parametrs
L=31.8*10^-3;
V=230;
f=50;
Xl=2*%pi*f*L;
Zcoil=sqrt(R*R+Xl*Xl);
I=V/Zcoil;
Phi=atan(Xl/R);
PF=cos(Phi);
P=V*I*cos(Phi);
disp("Amperes",I,"Circuit Current");
disp("Degrees",Phi,"Phase angle");
disp(PF,"Power factor");
disp("Watts",P,"Power consumed");
```

Scilab code Exa 2.30 To find parameters of an AC circuit

```
clc
V=200;                        //Assigning values to
   parameters
R=20;
f=50;
L=0.1;
Xl=2*%pi*f*L;
C=50*10^-6;
Xc=1/(2*%pi*f*C);
X=Xc-Xl;
Z=R-%i*X;
```

```
[Ro,theta]=polar(Z)
I=V/Ro;
PF=cos(theta);
PA=V*I*PF;
PR=V*I*sin(theta);
P=V*I;
disp("Amperes",I,"Circuit Current");
disp("Ohms",Z,"Circuit Impedance");
disp(real(PF),"Power Factor");
disp("Watts",real(PA),"Active Power");
disp("VAR",real(PR),"Reactive Power");
disp("Watts",P,"Apparen Power");
```

Scilab code Exa 2.31 To find current and voltage

```
clc
V=200+%i*0;                 //Assigning values to
    parameters
R1=10;
R2=20;
R=R1+R2;
L1=0.05;
L2=0.1;
f=50;
Xl1=2*%pi*f*L1;
Xl2=2*%pi*f*L2;
Xl=Xl1+Xl2;
C=50*10^-6;
Xc=1/(2*%pi*f*C);
X=Xc-Xl;
Z=R-%i*X;
[Ro,theta]=polar(Z);
I=V/Z;
Z1=R1+%i*Xl1;
Z2=R2-%i*(Xc-Xl2)
```

```
[Ro1,Theta1]=polar(Z1);
[Ro2,Theta2]=polar(Z2);
[ro,th]=polar(I);
V1=ro*Ro1;
V2=ro*Ro2;
disp("Amperes",ro,"Circuit Current");
disp("Volts",V1,"Voltage V1");
disp("Volts",V2,"Voltage V2");
```

Scilab code Exa 2.32 To find Z2

```
clc
V=100+0*%i;                          //Assignig values to
    parametrs
Z1=17.32+10*%i;
V1=34.64-20*%i;
V2=V-V1;
[Ro,Theta]=polar(V2);
[ro,theta]=polar(Z1);
[r,t]=polar(V1);
I=[r,t]/[ro,theta];
[ro1,t1]=polar(I);
Z2=[Ro,Theta]/[ro1,t1];
disp("Ohms",Z2,"Impedance Z2");
```

Scilab code Exa 2.33 To determine impedance and power consumed

```
clc
V=150+180*%i;             //Assigning values to
   parameters
I=5-4*%i;
Z=V/I;
disp("Ohms",Z,"Impedance");
```

```
[Ro,Theta]=polar(Z);
P=V*I*cos(Theta);
[r,t]=polar(P);
disp("Watts",r,"Power consumed");
```

Scilab code Exa 2.34 To find average power taken

```
clc
V=127.28+%i*0;                   //Assigning values to
   parameters
I=1.251-%i*1.251
Z=V/I;
[Ro,Theta]=polar(I)
P=V*I*cos(Theta);
[r,t]=polar(P)
disp("Ohms",Z,"Resistive and reactive part of
   impedance");
disp("Watts",r,"Average Power taken");
```

Scilab code Exa 2.35 To determine Z2

```
clc
Z1=12.5+%i*21;                   //Assigning values to
   parameters
V=50+%i*0;
I1=V/Z1;
I2=0.722-0.723*%i;
Z=V/I2;
Z2=Z-Z1;
[r,t]=polar(Z2);
disp("Ohms",r,"Impedance Z2");
```

Scilab code Exa 2.40 To determine active and reactive and apparent Power

```
clc
function v=f(t), v=200*sin(377*t), endfunction
             //Defining functions
function i=f1(t), i=8*sin(377*t-%pi/6), endfunction
V=200/sqrt(2);                    //Assigning values to
    parameters
I=8/sqrt(2);
P=V*I*cos(%pi/6)
disp("Watts",P,"Active Power");
Q=V*I*sin(%pi/6);
disp("VAR",Q,"Reactive Power");
S=V*I;
disp("VA",S,"Apparent Power");
```

Scilab code Exa 2.43 To find impedance and Power

```
clc
function i=f(t), i=5*sin(314*t+2*%pi/3), endfunction
    ;   //Defining functions
function v=f1(t), v=20*sin(314*t+5*%pi/6),
    endfunction;
I=-1.77+3.065*%i;
V=-12.24+7.07*%i;
Z=V/I;
[r,t]=polar(Z);
P=V*I*cos(t);
[ro,theta]=polar(P);
disp("Ohms",r,"Impedance");
disp("Watts",ro,"Average Power");
```

Scilab code Exa 2.45 To find values of R and C

```
clc
f=50;
I=5;
V=250;
I1=5.8
Z=V/I;
A=[1 (1/(2*%pi*50))^2; 1 (1/(2*%pi*60))^2]
B=[50^2; 43.1^2];
res=inv(A)*B;
r=res(1,1);
P=I1^2*sqrt(r);
disp("Watts",P,"Power absorbed");
```

Scilab code Exa 2.46 To find value of L and C

```
clc
function vl=f(t), vl=300*sin(1000*t), endfunction;
      //Defining functions
R=20;          //Assigning values to parameters
w=1000;
Z=R/cos(%pi/4);
Xc=sqrt(Z*Z-R*R);
Xl=2*Xc;
L=Xl/w;
C=1/(w*Xc);
disp("Henry",L,"Inductance Value");
disp("Farad",C,"Capacitance Value");
```

Scilab code Exa 2.47 To find value of supply voltage

```
clc
Vr=10;          //Assigning values to parameters
Vl=15;
Vc=10;
V=sqrt(Vr^2+(Vl-Vc)^2);
V=10+%i*0+0+%i*15+0-%i*10;
[r,t]=polar(V);
disp("Volts",r,"Voltage");
```

Scilab code Exa 2.48 To find R and C

```
clc;
L=0.01;          //Assigning value sto parameters
fr=50;
function v=f(t), y=400*sin(3000*t-10),endfunction;
     //Defining functions
function i=f1(t),i=10*sqrt(2)*cos(3000*t-55),
   endfunction;
V=278.54-%i*49.11;
I=8.191+5.7*%i;
Z=V/I;
R=real(Z);
Xl=3000*L;
Xc=50;
C=1/(2*%pi*fr*Xc);
disp("Ohms",R,"resistance R");
disp("Farad",C,"Capacitance C");
```

Scilab code Exa 2.49 To find coil resistance and supply voltage

```
clc
```

```
Vr=25;                  //Assigning values to parameters
Vcoil=40;
Vc=55;
Vrcoil=50;
I=0.345;
C=20*10^-6;
Xc=Vc/I;
f=1/(2*%pi*C*Xc);
R=Vr/I;
Zcoil=Vcoil/I;
Zrcoil=Vrcoil/I;
r=(Zrcoil^2-(R^2+Zcoil^2))/(2*R);
Xl=sqrt(Zcoil^2-r^2);
Z=sqrt((R+r)^2+(Xc-Xl)^2);
V=I*Z;
disp("Volts",V,"Voltage");
```

Scilab code Exa 2.50 To compute various parameters

```
clc
R=10;                   //Assigning values to parameters
L=0.014;
C=100*10^-6;
wr=1/sqrt(L*C);
Q=(1/R)*(sqrt(L/C));
BW=R/L;
w1=wr-BW/2;
w2=wr+BW/2;
Vm=1;
V=1/sqrt(2);
Vc=(V/R)*sqrt(L/C);
disp("rad/sec",wr,"Resonant frequency");
disp(Q,"Quality factor");
disp("rad/sec",BW,"Bandwidth");
disp("rad/sec",w1,"Lower frequency");
```

```
disp("rad/sec",w2,"Upper frequency");
disp("Volts",Vc,"Maximum value of voltage across
    capacitor");
```

Scilab code Exa 2.51 To find parameters

```
clc
V=10/sqrt(2);            //Assigning values to
    parameters
Vc=500;
BW=400/(2*%pi);
R=100;
Q=Vc/V;
fr=BW*Q;
f1=fr-BW/2;
f2=fr+BW/2;
L=R/(2*%pi*BW);
fr=1/(2*%pi*sqrt(L*C));
C=1/(fr*fr*4*%pi*%pi*L);
disp("Hertz",fr,"Resonant frequency");
disp("Hertz",f1,"Lower frequency");
disp("Hertz",f2,"Upper frequency");
disp("Henry",L,"Inductor value");
disp("Farads",C,"Capacitor value");
```

Scilab code Exa 2.52 To find resistanca and inductance of a coil and also the Q factor of the circuit

```
clc
f=1*10^6;                //Assigning values to
    parameters
C1=500*10^-12;
C2=600810^-12;
```

```
Xl=1/(2*%pi*f*C1);
L=Xl/(2*%pi*f);
R=30.623;
Q=(1/R)*sqrt(L/C1);
disp("Ohms",R,"Resistance');
disp("Henry",L,"Inductance");
disp(Q,"Quality Factor");
```

Scilab code Exa 2.53 To find current and voltage across capacitor

```
clc
r=2;                      //Assigning values to parameters
L=0.01
V=230;
f=50;
C=1/(f*f*4*%pi*%pi*L);
Ir=V/r;
Vc=(V/r)*sqrt(L/C);
disp("Amperes",Ir,"Current across capacitor");
disp("Volts",Vc,"Voltage across the capacitor");
```

Scilab code Exa 2.54 To find resonant frequency and voltage at resonance

```
clc
L=0.1;                        //Assigning values to parameters
R=10;
V=230;
f=50;
C=200*10^-6;
Xl=2*%pi*f*L;
Xc=1/(2*%pi*f*C);
```

```
Z=sqrt(R*R+(Xl-Xc)*(Xl-Xc));
I=V/Z;
Zcoil=sqrt(R*R+Xl*Xl);
Vcoil=I*Zcoil;
Vc=I*Xc;
disp("Amperes",I,"Circuit Current");
disp("Ohms",Zcoil,"Coil impedance");
disp("Volts",Vcoil,"Coil voltage");
disp("Volts",Vc,"Capacitor Voltage");
fr=1/(2*%pi*sqrt(L*C));
Ir=V/R;
Xl=2*%pi*fr*L;
Xc=Xl;
Zcoil=sqrt(R*R+Xl*Xl);
Vcoil=Ir*Zcoil;
Vc=Ir*Xc;
disp("Amperes",Ir,"Circuit Current at resonance");
disp("Ohms",Zcoil,"Coil impedance at resonance");
disp("Volts",Vcoil,"Coil voltage at resonance");
disp("Volts",Vc,"Capacitor Voltage at resonance");
```

Scilab code Exa 2.55 to determine R L C

```
clc
Vr=200;             //Assiging values to parameters
P=15.3;
fr=10000;
BW=1000;
R=Vr^2/P;
Q=fr/BW;
L=Q*R/(2*%pi*fr);
C=1/(4*%pi*%pi*fr*fr*L);
disp("Ohms",R,"resistance");
disp("henry",L,"inductor");
disp("Farads",C,"Capacitor");
```

Scilab code Exa 2.56 To find line current and power factor and power consumed

```
clc
R=20;                //Assigning values to parameters
L=31.8*10^-3;
V=230;
f=50;
I1=V/R;
Xl=2*%pi*f*L;
I2=V/Xl;
I=sqrt(I1*I1+I2*I2);
pf=I1/I;
P=V*I*pf;
disp("Amperes",I,"Line current");
disp(pf,"Power factor");
disp("Watts",P,"Power consumed");
```

Scilab code Exa 2.57 To determine parameters

```
clc
V=230+%i*0;                //Assigning values to
    parameters
L=10*10^-3;
f=50;
R=10;
Xl=2*%pi*f*L;
Xc=1/(2*%pi*f*C);
Z1=10+%i*3.14;
Z2=10-%i*6.37;
Z=(Z1*Z2)/(Z1+Z2);
```

```
I=V/Z;
I1=V/Z1;
I2=V/Z2;
[r,t]=polar(Z1);
[ro,th]=polar(Z2);
[rot,tt]=polar(Z);
pf1=cos(t);
pf2=cos(th);
pft=cos(tt);
P1=I1*I1*R;
P2=I2*I2*R;
disp("Ohms",polar(Z),"Total Impedance");
disp("Amperes",polar(I1),"Branch current I1");
disp("Amperes",polar(I2),"Branch current I2");
disp(polar(pf1),"Power factor of branch 1");
disp(polar(pf2),"Power factor of branch 2");
disp(polar(pft),"Total Power factor");
disp("Watts",polar(P1),"Power consumed by branch 1");
disp("Watts",polar(P2),"Power consumed by branch 2");
```

Scilab code Exa 2.58 To determine branch currents and total current

```
clc
Vm=100;          //Assigning values to parameters
w=3;
function v=f(t), v=Vm*sin(w*t), endfunction    //Defining voltage equation
V=Vm/sqrt(2)+0*%i;
L=1/3;
Xl=w*L;
C=1/6;
Xc=1/(w*C);
Z1=1+%i*1;
```

```
Z2=1-%i*2;
I1=V/Z1;
I2=V/Z2;
I=I1+I2;
disp("Amperes",polar(I1),"Branch current I1");
disp("Amperes",polar(I2),"Branch current I2");
disp("Amperes",polar(I),"Total current");
```

Scilab code Exa 2.59 To determine power taken by each branch

```
clc
Z1=10+%i*15;            //Assigning values to
   parameters
Z2=6-%i*8;
I=15;
Z=(Z1*Z2)/(Z1+Z2);
V=I*Z;
I1=V/Z1;
I2=V/Z2;
P1=I1^2*real(Z1);
P2=I2^2*real(Z2);
disp("Watts",polar(P1),"Power taken by branch 1");
disp("Watts",polar(P2),"Power taken by branch 2");
```

Scilab code Exa 2.60 To determine various parameters

```
clc
V=200;          //Assigning values to parameters
f=50;
Ra=10;
La=0.12;
Rb=20;
Cb=40*10^-6;
```

```
Xla=2*%pi*f*La;
Xcb=1/(2*%pi*f*Cb);
Za=Ra+%i*Xla;
Zb=Rb-%i*Xcb;
Zeq=(Za*Zb)/(Za+Zb);
[r,t]=polar(Zeq);
Ia=V/Za;
Ib=V/Zb;
pf=cos(t);
disp("Amperes",polar(Ia),"Branch current 1");
disp("Amperes",polar(Ib),"Branch current 2");
disp(real(pf),"power factor");
```

Scilab code Exa 2.61 To find the supply current

```
clc
Z1=14.14-%i*14.14;              //Assigning values to parameters
Z2=26+%i*15;
I=10;
Zeq=Z1+Z2;
V=I*Zeq;
Zeq=(Z1*Z2)/(Z1+Z2);
I=V/Zeq;
disp("Amperes",polar(I),"Supply current");
```

Scilab code Exa 2.62 To find I1 and I2

```
clc
I=25*%i;              //Assigning values to parameters
Z1=3-%i*4;
Z2=10;
I1=I*Z2/(Z1+Z2);
```

```
I2=I-I1;
disp("Amperes",polar(I1),"Current I1");
disp("Amperes",polar(I2),"Current I2");
```

Scilab code Exa 2.63 To determine kW kVAR kVA and power factor

```
clc
V=120+%i*160;          //Assigning values to parameters
Z1=12+%i*16;
Z2=10-%i*20;
I1=V/Z1;
I2=V/Z2;
[r,t]=polar(Z1);
kW1=(V*I1*cos(t))/1000;
kVAR1=(V*I1*sin(t))/1000;
kVA1=(V*I1)/1000;
[ro,th]=polar(Z2);
kW2=(V*I2*cos(th))/1000;
kVAR2=(V*I2*sin(th))/1000;
kVA2=(V*I2)/1000;
Zeq=(Z1*Z2)/(Z1+Z2);
[R,T]=polar(Zeq);
pf=cos(T);
disp(polar(kW1),"kW1");
disp(polar(kVAR1),"kVAR1");
disp(polar(kVA1),"kVA1");
disp(polar(kW2),"kW2");
disp(polar(kVAR2),"kVAR2");
disp(polar(kVA2),"kVA2");
disp(pf,"Power factor");
```

Scilab code Exa 2.65 To determine parameters

```
clc
R=30;                   //Assigning values to parameters
I=5;
V=110;
f=50;
I1=V/R;
I2=sqrt(I^2-I1^2);
Xc=V/I2;
C=1/(2*%pi*f*Xc);
disp("Farads",C,"Unknown capacitance when total current drawn is 5 A");
Inew=4;
I2new=sqrt(Inew^2-I1^2);
Xc=V/I2new;
f=1/(2*%pi*C*Xc);
disp("hertz",f,"Frequency when total current drawn is 4 A");
```

Scilab code Exa 2.66 To determine equivalent impedance

```
clc
L1=0.0191                   //Assigning values to parameters
f=50;
Xl1=2*%pi*f*L1;
C=398*10^-6;
Xc=1/(2*%pi*f*C);
L3=0.0318
Xl3=2*%pi*f*L3;
Z1=2+%i*Xl1;
Z2=7-%i*Xc;
Z3=8+%i*Xl3;
Zeq=((Z1*Z2)/(Z1+Z2))+Z3;
disp("Ohms",Zeq,polar(Zeq),"Equivalent Impedance");
```

Scilab code Exa 2.68 To determine branch currents

```
clc
Za=10+%i*8;                    //Assigning values to
   parameters
Zb=9-%i*6;
Zc=3+%i*2;
V2=100;
I=V2/Zc;
Ia=(I*Zb)/(Za+Zb);
Ib=I-Ia;
disp("Amperes",Ia,polar(Ia),"Current Ia");
disp("Amperes",Ib,polar(Ib),"Current Ib");
```

Scilab code Exa 2.69 To determine various parameters

```
clc
Im1=20;             //Assigning values to parameters
Im2=40;
Im=25;
function i1=f(wt), i1=Im1*sin(wt), endfunction
function i2=f(wt), i2=Im2*sin(wt+%pi/6), endfunction
function i=f(wt), i=Im*sin(wt+%pi/6), endfunction
Z=6+%i*8;
I1=Im1/sqrt(2);
I2=24.49+%i*14.14;
I=15.31+%i*8.84;
I3=I-(I1+I2);
V=I*Z;
[r,t]=polar(Z);
P=V*I*cos(t);
Z1=V/I1;
```

```
disp("Amperes",I3,polar(I3),"Current I3");
disp("Volts",V,polar(V),"Supply Voltage");
disp("Watts",P,polar(P),"Active Power");
disp("Ohms",Z1,polar(Z1),"Impedance Z1");
```

Scilab code Exa 2.70 To calculate admittance

```
clc;
Z=8.66+%i*5;         //Assigning values to parameters
Y=1/Z;
G=real(Y);
B=imag(Y);
disp("Mho",G,"G");
disp("Mho",B,"B");
```

Scilab code Exa 2.71 To determine various parameters

```
clc
V=230;               //Assigning value to parameters
f=50;
Z1=8.66-5*%i;
Z2=10+17.32*%i;
Z3=40;
Y1=1/Z1;
Y2=1/Z2;
Y3=1/Z3;
Y=Y1+Y2+Y3;
Z=1/Y;
[r,t]=polar(Z);
I=V/Z;
pf=cos(t);
P=V*I*pf;
disp("Mho",Y1,polar(Y1),"Y1");
```

```
disp("Mho",Y2,polar(Y2),"Y2");
disp("Mho",Y3,polar(Y3),"Y3");
disp("Ohms",Y,polar(Y),"Equivalent Admittance");
disp("Ohms",Z,polar(Z),"Equivalent Impedance");
disp("Amperes",I,polar(I),"Total current");
disp("Watts",P,polar(P),"Power consumed");
disp(polar(pf),"Power factor");
```

Scilab code Exa 2.72 To calculate equivalent impedance admittance and total current

```
clc
V=200;                    //Assigning values to parameters
Z1=5*%i;
Z2=5+%i*8.66;
Z3=15;
Z4=-10*%i;
Y1=1/Z1;
Y2=1/Z2;
Y3=1/Z3;
Y4=1/Z4;
Yeq=Y1+Y2+Y3+Y4;
Zeq=1/Yeq;
I=V/Zeq;
disp("Amperes",I,polar(I),"Total current");
```

Scilab code Exa 2.73 To calculate admittance

```
clc
Xl=4;                     //Assigning values to parameters
Xc=8;
Z1=1;
```

```
Z2=4*%i;
Z3=-%i*8;
Zeq=Z1+(Z2*Z3)/(Z2+Z3);
Y=1/Zeq;
disp("Mho",Y,polar(Y),"Admittance");
Xl=10;
Xc=5;
Z1=1;
Z2=10*%i;
Z3=-%i*5;
Zeq=Z1+(Z2*Z3)/(Z2+Z3);
Y=1/Zeq;
disp("Mho",Y,polar(Y),"Admittance");
```

Scilab code Exa 2.74 To determine various parameters

```
clc
Z1=14+%i*5;              //Assigning values to
    parameters
Z2=18+%i*10;
V=200;
Y1=1/Z1;
Y2=1/Z2;
Yeq=Y1+Y2;
Zeq=1/Yeq;
I1=V/Z1;
I2=V/Z2;
I=V/Zeq;
P1=I1^2*real(Z1);
P2=I2^2*real(Z2);
[r,t]=polar(Zeq);
[r1,t1]=polar(Z1);
[r2,t2]=polar(Z2);
pf1=cos(t1);
pf2=cos(t2);
```

```
pf=cos(t);
disp("Mho",Y1,polar(Y1),"Y1");
disp("Mho",Y2,polar(Y2),"Y2");
disp("Mho",Yeq,polar(Yeq),"Yeq");
disp("Amperes",I1,polar(I1),"Branch current I1");
disp("Amperes",I2,polar(I2),"Branch current I2");
disp("Amperes",I,polar(I),"Total current I");
disp("Watts",P1,polar(P1),"Power consumed by branch
    1");
disp("Watts",P2,polar(P2),"Power consumed by branch
    2");
disp(polar(pf1),"Power factor of branch 1");
disp(polar(pf2),"Power factor of branch 2");
disp(polar(pf),"Total Power factor");
```

Scilab code Exa 2.75 To determine various parameters

```
clc
V=230;           //Assigning values to parameters
f=50;
L=0.08;
Xl=2*%pi*f*L;
C=200*10^-6;
Xc=1/(2*%pi*f*C);
Z1=20+%i*25.13;
Z2=10-%i*15.92;
Y1=1/Z1;
Y2=1/Z2;
Y=Y1+Y2;
I=V*Y;
[r,t]=polar(I);
pf=cos(t);
Z=1/Y;
R=real(Z);
Xc=-1*imag(Z);
```

```
C=1/(2*%pi*f*Xc);
disp("Amperes",I,polar(I),"Supply Current");
disp(pf,polar(pf),"Power factor");
disp("Ohms",Z,polar(Z),"Total impedance");
disp("Ohms",R,"Resistance of eequivalent series
    circuit");
disp("Farads",C,"Capacitance of eequivalent series
    circuit");
```

Scilab code Exa 2.76 To determine total impedance current and power factor

```
clc
V=200;           //Assigning values to parameters
Z1=3+4*%i;
Z2=4-%i*3;
Z3=4.57+%i*5.51;
Y1=1/Z1;
Y2=1/Z2;
Yab=Y1+Y2;
Zab=1/Yab;
Z=Zab+Z3;
I=V/Z;
[r,t]=polar(Z);
pf=cos(t);
disp("Ohms",Z,polar(Z),"Total Impedance");
disp("Amperes",I,polar(I),"Supply current");
disp(pf,polar(pf),"Power factor");
```

Scilab code Exa 2.77 To determine various parameters

```
clc
```

```
C=2.5*10^-6;           //Assigning values to
    parameters
R=15;
L=260*10^-3;
temp=(1/(L*C))-(R^2/L^2);
fr=(1/20*%pi)*sqrt(temp);
Q=(2*%pi*fr*L)/R;
Zr=L/(C*R);
disp("Hertz",fr,"Resonant frequeny");
disp(Q,"Quality factor");
disp("Ohms",Zr,"Dynamic Impedance");
```

Scilab code Exa 2.78 To find supply voltage value and total current

```
clc
C=200*10^-6;           //Assigning values to
    parameters
V=230;
R=20;
L=0.2;
temp=(1/(L*C))-(R^2/L^2);
fr=(1/20*%pi)*sqrt(temp);
Zr=L/(C*R);
Ir=V/Zr;
Zl=sqrt(R^2+(2*%pi*fr*L)^2);
Il=V/Zl;
Xc=1/(2*%pi*fr*C);
Ic=V/Xc;
phi=atan(2*%pi*fr*L/R);
disp("Hertz",fr,"Resonant frequency");
```

Scilab code Exa 2.79 To determine value of capacitance

```
clc
pfcoil=0.3;             //Assigning values to parameters
phi=acos(pfcoil);
V=100;
f=50;
Il=1;
Ic=Il*sin(phi);
Xc=V/Ic;
C=1/(2*%pi*f*Xc);
Ir=Il*cos(phi);
Zr=V/Ir;
disp("Farads",polar(C),"Capacitance");
disp("Ohms",polar(Zr),"Dynamic impedance");
```

Scilab code Exa 2.80 To determine various parameters

```
clc
V=200;          //Assigning values to parameters
f=50;
L=20;
R=15;
Zl=sqrt(R^2+L^2);
pfcoil=R/Zl;
phi=acosd(pfcoil);
Il=V/Zl;
Ic=Il*sind(phi);
Xc=V/Ic;
C=1/(2*%pi*f*Xc);
Ir=Il*cosd(phi);
disp(polar(pfcoil),"Power factor");
disp("Amperes",polar(Il),"Current");
disp("Farads",C,"Value f shunting capacitance");
disp("Amperes",polar(Ir),"Circuit current at resonance");
```

Chapter 3

Three phase circuits

Scilab code Exa 3.1 To find parameters for Star and Delta connected circuits

```
clc
f=50;                          //Assigning values to
   parameters
Vl=400;
Rph=20;
L=0.5;
Xl=2*%pi*f*L;
Zph=20+%i*157;
[r,t]=polar(Zph);
Vph=Vl/sqrt(3);               //Star connection
Iph=Vph/r;
Il=Iph;
P=sqrt(3)*Vl*Il*cos(t);
disp("Amperes",Il,"The line current for Star
   connection is");
disp("Watts",polar(P),"The total power absorbed in
   Star connection is");
Vph=Vl;                      //Delta connection
Iph=Vph/r;
Il=sqrt(3)*Iph;
```

```
P=sqrt(3)*Vl*Il*cos(t);
disp("Amperes",Il,"The line current for Delta
   connection is");
disp("Watts",polar(P),"The total power absorbed in
   Delta connection is");
```

Scilab code Exa 3.2 To find parameters of star connected circuit

```
clc
f=50           //Assigning values to parameters
rph=8
l=0.02
xl=2*%pi*f*l
vl=230
f=50
vph=vl/sqrt(3)
zph=8+%i*6.28
[r,t]=polar(zph)
iph=vph/r
il=iph
p=sqrt(3)*vl*il*cos(t)
q=sqrt(3)*vl*il*sin(t)
s=sqrt(3)*vl*il
disp("Amperes",il,"The line current is")
disp("Watts",polar(p),"The total Power absorbed is")
disp("VAR",polar(q),"The reactive volt amperes is")
disp("Volt Ampere",polar(s),"The Volt amperes is")
```

Scilab code Exa 3.3 To find line current phase current and power absorbed by a delta connected circuit

```
clc;
Vl=230;        //Assigning values to parameters
```

```
f=50;
Rph=15;
L=0.03;
Xl=2*%pi*f*L;
Zph=15+%i*9.42;
[r,t]=polar(Zph)
Vph=Vl;
Iph=Vph/r;
Il=sqrt(3)*Iph;
P=sqrt(3)*Vl*Il*cos(t);
disp("Amperes",Iph,"Phase current");
disp("Amperes",Il,"Line current");
disp("Watts",polar(P),"Power absorbed");
```

Scilab code Exa 3.4 To find capacitive reactance and Power consumed

```
clc
f=50              //assigning values to the parameters
xc=200
vph=400
vl=vph
zph=14.151-%i*200
[r,t]=polar(zph)
iph=vph/zph
il=sqrt(3)*iph
p=sqrt(3)*vl*il*cos(t)
pwr=vph*iph*cos(t)
c=1/(2*%pi*f*xc)
disp("Watts",polar(pwr),"power consumed in each
    branch of delta is")
disp("Farads",c,"capacitive reactance is")
```

Scilab code Exa 3.5 To find various parameters

```
clc
l=50                    //Assigning values to
    parameters
w=800
c=50
xl=w*l
xc=1/(w*c)
z1=0+%i*40
z2=50
z3=0-%i*25
zph=z1+z2*z3/(z2+z3)
[r,t]=polar(zph)
vl=550
vph=vl
iph=vph/zph
il=sqrt(3)*iph
p=sqrt(3)*vl*il*cos(t)
pf=cos(t)
q=sqrt(3)*vl*il*sin(t)
s=sqrt(3)*vl*il
disp("Amperes",polar(iph),"The phase current is")
disp("Amperes",polar(il),"The line current is")
disp("watts",polar(p),"The power drawn is")
disp(polar(pf),"The power factor is")
disp("watts",polar(q),"The reactive power is")
disp("KVA",polar(s),"The kva rating of load is")
```

Scilab code Exa 3.7 To find values of circuit elements

```
clc
p=10000                      //Assigning values to
    parameters
t=acos(0.6)
vl=440
vph=vl
```

```
il=p/(sqrt(3)*vl*cos(t))
iph=il/sqrt(3)
zph=vph/iph
zph1=20.9-%i*27.87
[res]=real(zph1)
[xc]=abs(imag(zph1))
q=sqrt(3)*vl*il*sin(t)
disp("ohms",res,"The resistance value of circuit
   element is")
disp("ohms",xc,"The capacitive value of circuit
   element is")
disp("VAR",q,"The reactive volt-ampere")
```

Scilab code Exa 3.8 To find values of resistance and inductance of each coil

```
clc
f=50                    //Assigning values to
   parameters
vl=440
p=1500
t=acos(0.2)
vph=vl/sqrt(3)
il=p/(sqrt(3)*vl*p*cos(t))
iph=il
zph=vph/iph
zph1=5.17+%i*25.3
[res]=real(zph1)
[xl]=imag(zph1)
l=xl/(2*%pi*f)
disp("ohms",res,"The resistive circuit constant is")
disp("ohms",l,"The inductive  circuit constant is")
```

Scilab code Exa 3.9 To find circuit constants

```
clc
p=100000                    //Assigning values to
    parameters
il=80
vl=1100
f=50
vph=vl/sqrt(3)
iph=il
zph=vph/iph
t=acosd(p/(sqrt(3)*vl*il))
zph1=5.21-%i*6
[r]=real(zph1)
[xc]=abs(imag(zph1))
c=1/(2*%pi*f*xc)
disp("ohms",r,"The resistive circuit constant is")
disp("ohms",xc,"The capacitive circuit constant is")
disp("farads",c,"The capacitance is")
```

Scilab code Exa 3.10 To find impedance in delta connected circuit

```
clc
Vl=400;                //Assigning values to
    parameters
Il=34.65;
P=14.4*10^3;
Vph=Vl;
Iph=Il/sqrt(3);
Zph=Vph/Iph;
t=acosd(P/(sqrt(3)*Vl*Il))
Z=complex(Zph,t);
disp("Ohms",Z,"Impedance");
disp("Ohms",real(Z),"Resistance");
disp("Ohms",imag(Z),"Reactance");
```

Scilab code Exa 3.11 To find various parameters

```
clc
vl=415            //assigning values to the parameters
r=15
l=0.1
c=0.000000177
f=50
vph=vl/sqrt(3)
xl=2*%pi*f*l
xc=1/(2*%pi*f*c)
zph=r+%i*(xl-xc)
[r1,t]=polar(zph)
iph=vph/zph
il=iph
p=sqrt(3)*vl*il*cos(t)
q=sqrt(3)*vl*il*sin(t)
s=sqrt(3)*vl*il
disp("Amperes",polar(iph),"The phase current is")
disp("Amperes",polar(il),"The line current is")
disp("Watts",polar(p),"The power drawn is")
disp("Watts",polar(q),"The reactive power is")
disp("VA",polar(s),"The total kVA is")
```

Scilab code Exa 3.12 To find power taken by resistor

```
clc
vl=400                 //assigning values to the parameters
t=0
```

```
zph=50
vph=vl/sqrt(3)
iph=vph/zph
il=iph
p=sqrt(3)*vl*il*cos(t)
disp("Watts",polar(p),"Power taken is")
iph=4
il=iph
p=vl*il*cos(t)
disp("Watts",polar(p),"Power taken after
    disconecting one of the resistor is")
```

Scilab code Exa 3.13 To find power taken by resistor

```
clc
vl=400                    //Assigning values to
    parameters
vph=vl
r=40
t=0
iph=vph/r
il=sqrt(3)*iph
p=sqrt(3)*vl*il*cos(t)
disp("Watts",polar(p),"Power taken is")
i=10
p=2*i*i*r
disp("Watts",polar(p),"Power taken after
    diconnecting one resistor is")
```

Scilab code Exa 3.16 To find total power and power factor after reversing the current of the coil

```
clc
```

```
w1=500          //Assigning values to parameters
w2=2500
p=w1+w2
t=atan(sqrt(3)*(w2-w1)/(w1+w2))
pf=cos(t)
disp("Watts",p,"Total Power supplied is")
disp(pf,"Power factor is")
w2=2500
w1=-500
p=w1+w2
t=atan(sqrt(3)*(w2-w1)/(w1+w2))
pf=cos(t)
disp("Watts",p,"Total Power supplied after reversing
    the connections to the current coil is")
disp(pf,"Power factor after reversing the
   connections to the current coil is")
```

Scilab code Exa 3.17 To determine various parameters

```
clc
w1=3000          //Assigning values to parameters
w2=5000
t=atan(sqrt(3)*(w2-w1)/(w1+w2))
pf=cos(t)
p=w1+w2
il=p/(sqrt(3)*vl*cos(t))
disp("Watts",p,"Total Power supplied is")
disp(pf,"Power factor is")
disp("Amperes",il,"The line current is")
```

Scilab code Exa 3.18 To determine various parameters

```
clc
```

```
w1=-1000          //Assigning values to parameters
w2=3000
vl=400
t=atan(sqrt(3)*(w2-w1)/(w1+w2))
pf=cos(t)
p=w1+w2
il=p/(sqrt(3)*vl*cos(t))
disp("Watts",p,"Total Power supplied is")
disp(pf,"Power factor is")
disp("Amperes",il,"The line current is")
```

Scilab code Exa 3.19 To determine various parameters

```
clc
w1=100000         //Assigning values to parameters
w2=300000
vl=2000
n=0.9
t=atan(sqrt(3)*(w2-w1)/(w1+w2))
pf=cos(t)
p=w1+w2
il=p/(sqrt(3)*vl*cos(t))
disp("Watts",p,"Total Power supplied is")
disp(pf,"Power factor is")
disp("Amperes",il,"The line current is")
```

Scilab code Exa 3.20 To find power factor

```
clc
vl=220          //Assigning values to parameters
il=38
n=0.88
p=11200
```

```
ip=p/n
t=acosd(ip/(sqrt(3)*vl*il))
pf=cosd(t)
w2=vl*il*cosd(30-t)
w1=vl*il*cosd(30+t)
disp("Watts",w2,"The wattmeter reading is")
disp("Watts",w1,"The wattmeter reading is")
disp(pf,"Power factor is")
```

Scilab code Exa 3.21 To find power factor

```
clc
w1=1          //Assigning values to parameters
w2=2*w1
t=atan(sqrt(3)*(w2-w1)/(w1+w2))
pf=cos(t)
disp(pf,"Power factor is")
```

Chapter 4

Single Phase Transformer

Scilab code Exa 4.1 To determine secondary voltage and primary and secondary currents

```
clc
n2=40                    //Assigning values to parameters
n1=600
kva=50
e1=2200
e2=e1*n2/n1
i1=kva*1000/e1
i2=kva*1000/e2
disp("Amperes",i1,"The primary full load current is"
   );
disp("Amperes",i2,"The secondary full load current
   is");
disp("Volts",e2,"The secondary voltage at node is");
```

Scilab code Exa 4.2 To determine various parameters

```
clc
```

```
e1=3200          //Assigning values to parameters
f=50
bm=1.2
e2=400
n2=111
kva=80
n1=e1*n2/e2
i2=kva*1000/e2
a=e2/(4.44*f*n2*bm)
disp(n1,"number of turns on primary windings is");
disp("Amperes",i2,"The secondary full load current
   is");
disp("meter square",a,"The cross-sectional area is")
   ;
```

Scilab code Exa 4.3 To find the number of turns

```
clc
e1=6000          //Assigning values to parameters
f=50
e2=250
fm=0.06
n1=e1/(4.44*f*fm)
n2=e2/(4.44*f*fm)
disp(n1,"number of turns on primary windings is");
disp(n2,"number of turns on secondary windings is");
```

Scilab code Exa 4.4 To determine various parameters

```
clc
n2=50                 //Assigning values to parameters
n1=500
kva=25
```

```
e1=3000
k=n2/n1
i1=kva*1000/e1
i2=i1/k
e2=k*e1
fm=e1/(4.44*f*n1)
disp("Amperes",i1,"The primary full load current is"
    );
disp("Amperes",i2,"The secondary full load current
    is");
disp("Volts",e2,"The secondary emf is");
disp("Wb",fm,"The maximum flux is");
```

Scilab code Exa 4.5 To find maximum value of flux and core loss and magnetiizing current

```
clc
e1=230              //Assigning values to parameters
v1=e1
i0=5
t=acosd(0.25)
n1=200
f=50
fm=e1/(4.44*f*n1)
w1=v1*i0*cosd(t)
iu=i0*sind(t)
disp("Wb",fm,"The maximum flux is");
disp("Watts",w1,"The core loss is");
disp("Amperes",iu,"The maximum current is");
```

Scilab code Exa 4.6 To find value of resistance referred to primary

```
clc
```

```
k=0.25             //Assigning values to parameters
sr=50
pr=sr/(k*k)
disp("ohms",pr,"The Secondary resistance is")
```

Scilab code Exa 4.9 To find copper loss at half load and 60 percent full load condition

```
clc
wf=2500            //Assigning values to parameters
w6=0.6*0.6*wf
w5=0.5*0.5*wf
disp("Watts",w6,"The copper loss at 60% full-load
   condition is");
disp("Watts",w5,"The copper loss at 50% full-load
   conditionis");
```

Scilab code Exa 4.10 To find copper loss at 75 percent full load condition

```
clc
w7=1200              //Assigning values to parameters
wf=w7/(0.75*0.75)
w5=0.5*0.5*wf
disp("Watts",w5,"The copper loss at 50% full-load
   condition is");
```

Scilab code Exa 4.11 To determine various parameters

```
clc;
V=230;               //Assigning values to parameters
```

```
VA=350;
loss=110;
I0=VA/V;
pf=loss/VA;
Iw=I0*pf;
Iu=sqrt(I0^2-Iw^2);
disp("Amperes",Iw,"Iron loss component of no load
    current");
disp("Amperes",Iu,"Magnatizing component of no load
    current");
disp(pf,"no load power factor");
```

Scilab code Exa 4.13 To find percentage regulation and secondary terminal voltage

```
clc
r1=0.2              //Assigning values to parameters
x1=0.75
r2=0.05
x2=0.2
pf=0.8
e2=125
e1=250
t=acosd(0.8)
k=e2/e1
kva=5
i2=kva*1000/e2
r02=r2+k*k*r1
x02=x2+k*k*x1
pr1=(i2*r02*cosd(t)-i2*x02*sind(t))*100/e2
v2=e2-(e2*pr1/100)
disp(pr1,"The percentage regulation at full load 0.8
     pf leading is");
disp("Volts",v2,"The secondary terminal voltage is")
    ;
```

Scilab code Exa 4.14 To find efficiency at different conditions

```
clc
r1=2          //Assigning values to parameters
r2=0.02
wi=412
pf=0.8
x=1
kva=50
e1=2300
e2=230
i2=kva*1000/e2
i1=kva*1000/e1
wcf=(i1*i1*r1)+(i2*i2*r2)
n1=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
   *0.001))
x=0.5
n2=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
   *0.001))
disp("Percent",n1,"Efficiency at full node 0.8pf is"
   )
disp("Percent",n2,"Efficiency at half full node 0.8
   pf is")
```

Scilab code Exa 4.15 To find load in KVA and maximum efficiency

```
clc
x=1              //Assigning values to parameters
kva=25
pf=0.8
wi=0.35
```

```
wcf=0.4
n1=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
    *0.001))
kva1=kva*(sqrt(wi/wcf))
nm=kva1*pf*100/((kva1*pf)+2*wi)
disp(kva1,"Load in KVA  is")
disp("Percent",nm,"Maximum Efficency is")
```

Scilab code Exa 4.16 To find efficiency and load in KVA

```
clc
x=1          //Assigning values to parameters
kva=40
pf=0.8
wi=450
wcf=850
n1=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
    *0.001))
x=sqrt(wi/wcf)
n2=x*kva*pf*100/((x*kva*pf)+(2*wi*0.001))
kva1=kva*sqrt(wi/wcf)
disp("Percent",n1,"Efficiency at full node 0.8pf is"
    )
disp("Percent",n2,"Maximum Efficency is")
disp(kva1,"Load in KVA at which maximum occurs is")
```

Scilab code Exa 4.17 To find values of resistances

```
clc
e1=2000          //Assigning values to parameters
e2=200
r1=2.3
x1=4.2
```

```
r2=0.025
x2=0.04
kva=20
i1=kva*1000/e1
i2=kva*1000/e2
k=e2/e1
r01=r1+r2/(k*k)
x01=x1+x2/(k*k)
r02=r2+k*k*r1
x02=x2+k*k*x1
disp("ohms",r01,"The equivalent primary resistance
    is")
disp("ohms",x01,"The equivalent primary reactance is
    ")
disp("ohms",r02,"The equivalent Secondary resistance
     is")
disp("ohms",x02,"The equivalent Secondary reactance
    is")
```

Scilab code Exa 4.18 To find load and maximum efficiency

```
clc
x=1          //Assigning values to parameters
kva=20
pf=0.8
wi=450
wcf=900
n1=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
    *0.001))
x=sqrt(wi/wcf)
n2=x*kva*pf*100/((x*kva*pf)+(2*wi*0.001))
disp("Percent',n1,"Efficiency at full node 0.8pf is"
    )
disp("Percent",n2,"Maximum Efficency is")
disp(x,"Load  at which maximum occurs is")
```

Scilab code Exa 4.20 To find efficiency

```
clc
nm=98          //Assigning values to parameters
x=0.5
kva=200
pf=1
wi=1000*((x*kva*pf*100/nm)/2-(x*kva*pf)/2)
wcu=wi
wcf=wcu/(0.5*0.5)
n1=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
   *0.001))
x=0.75
n2=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
   *0.001))
disp("Watts",wi,"The core loss is");
disp(n1,"Efficiency at full node 0.8pf is")
disp(n2,"Efficiency at 75% full node 0.8pf is")
```

Scilab code Exa 4.21 To find various parameters

```
clc
r1=0.3          //Assigning values to parameters
r2=0.01
x1=1.1
x2=0.035
kva=100
v1=2200
e1=v1
n1=400
n2=80
```

```
k=n2/n1
r01=r1+r2/(k*k)
x01=x1+x2/(k*k)
z01=sqrt(r01*r01+x01*x01)
e2=k*e1
i2=kva*1000/e2
r02=k*k*r01
x02=k*k*x01
pr1=(i2*r02*cosd(t)-i2*x02*sind(t))*100/e2
v2=e2-(e2*pr1/100)
disp("ohms",z01,"The equivalent primary resistance
   is")
disp(pr1,"The percentage voltage regulation at full
   load 0.8 pf leading is");
disp("Volts",v2,"The secondary terminal voltage is")
```

Scilab code Exa 4.22 To find KVA at maximum efficiency

```
clc
E2=20;          //Assigning values to parameters
E1=1000;
kva=5;
I2=kva*1000/E2;
K=E2/E1;
R01=4.4
R02=K*K*R01;
X01=8.98
X02=K*K*X01;
pf=0.8
percentreg=(I2*R02*pf+I2*X02*sqrt(1-pf*pf))*100/E2;
disp(percentreg,"Percentage maximum regulation")
wi=90
I1=kva*1000/E1
Wcf=I1*I1*R01
kvam=kva*sqrt(wi/Wcf)
```

```
disp(kvam,"kva at maximum Efficency is")
```

Scilab code Exa 4.23 To find secondary voltage

```
clc
v1=200                         //Assigning values to
   parameters
i0=0.7
w=70
k=400/200
t=acosd(w/(v1*i0))
iw=i0*cosd(t)
iu=i0*sind(t)
r0=v1/iw
x0=v1/iu
vsc=15
i2=10
w=85
r02=w/(i2*i2)
z02=vsc/i2
x02=sqrt(z02*z02-r02*r02)
r01=r02/(k*k)
x01=x02/(k*k)
e2=400
i2=5*1000/(0.8*e2)
v2=e2-i2*r02*cosd(t)-i2*x02*sind(t)
disp("Volts",v2,"The secondary Voltage is")
```

Scilab code Exa 4.24 To find various parameters

```
clc
wi=1000                      //Assigning values to
   parameters
```

```
kva=50
e1=2200
ifl=kva*1000/e1
x=1
pf=0.8
wcf=(ifl/20)*(ifl/20)*500
n1=x*kva*pf*100/((x*kva*pf)+(wi*0.001)+(x*x*wcf
   *0.001))
x=sqrt(wi/wcf)
n2=x*kva*pf*100/((x*kva*pf)+(2*wi*0.001))
disp(n1,"Efficiency at full node 0.8pf is")
disp(n2,"Maximum Efficency is")
disp(x,"Load  at which maximum occurs is")
```

Scilab code Exa 4.25 To find percentage regulation

```
clc
kva=5                    //Assigning values to
   parameters
e2=400
r02=0.85
x02=1.236
i2f=kva*1000/e2
t=acosd(0.8)
pr1=(i2f*r02*cosd(t)+i2f*x02*sind(t))*100/e2
pr2=(i2f*r02*cosd(t)-i2f*x02*sind(t))*100/e2
disp(pr1,"The percentage regulation at full load 0.8
    pf lagging is");
disp(pr2,"The percentage regulation at full load 0.8
    pf leading is");
```

Scilab code Exa 4.26 To find efficiency

```
clc
cl=(10/12)*(10/12)*100            //Assigning values
   to parameters
op=500*10*0.8
il=80
eff=op*100/(op+il+cl)
disp(eff,"The efficiency is")
```

Scilab code Exa 4.27 To find efficiency

```
clc
kw=15           //Assigning values to parameters
t=acosd(0.8)
kva=kw/cosd(t)
x=kva/25
wcf=500
cl1=0.75*0.75*wcf
kw=20
t=acosd(0.9)
kva=kw/cosd(t)
x=kva/25
cl2=x*x*500
kw=10
t=acosd(0.9)
kva=kw/cosd(t)
x=kva/25
cl3=x*x*500
tec=cl1*6+cl2*10+cl3*4
tei=400*24
eo=330000
n=eo*100/(eo+tei+tec)
disp(n,"The efficiency is")
```

Scilab code Exa 4.28 To find efficiency

```
clc
kw=400              //Assigning values to parameters
pf=0.8
kva=kw/pf
cl1=4.5
kw=300
pf=0.75
kva=kw/pf
cl2=(kva/500)*(kva/500)*4.5
kw=400
pf=0.8
kva=kw/pf
cl3=(kva/500)*(kva/500)*4.5
tec=cl1*6+cl2*10+cl3*4
tei=84
eo=5800
n=eo*100/(eo+tei+tec)
disp(n,"The efficiency is")
```

Scilab code Exa 4.29 To find efficiency

```
clc
nm=0.98              //Assigning values to parameters
kva=15
x=1
pf=1
wi=((x*kva*pf/nm)/2-(x*kva*pf)/2)
wcu=wi
kw=2
pf=0.5
kva=kw/pf
cl1=(kva/15)*(kva/15)*wi
kw=12
```

```
pf=0.8
kva=kw/pf
cl2=0.153
kw=18
pf=0.9
kva=kw/pf
cl3=(kva/15)*(kva/15)*wi
tec=cl1*12+cl2*6+cl3*6
tei=3.672
eo=204
n=eo*100/(eo+tei+tec)
disp(n,"The efficiency is")
```

Scilab code Exa 4.30 To find efficiency

```
clc
cl1=1.5              //Assigning values to parameters
cl2=0.5*0.5*cl1
tec=cl1*3+cl2*4
tei=36
eo=500
n=eo*100/(eo+tei+tec)
disp(n,"The efficiency is")
```