

Scilab Textbook Companion for
Basic Electrical And Electronics Engineering
by R. R. Singh¹

Created by
Pooja Jagadeesan
Engineering
Electronics Engineering
Mumbai University
College Teacher
Prof Vrischa Chavan
Cross-Checked by
Prof Vrischa Chavan

May 20, 2016

¹Funded 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: Basic Electrical And Electronics Engineering

Author: R. R. Singh

Publisher: Tata McGraw - Hill Education, New Delhi

Edition: 1

Year: 2009

ISBN: 978-0-07-014613-6

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	4
1 Basic Circuit Concepts	5
2 DC CIRCUITS	21
3 AC Fundamentals	50
4 Three Phase Circuits	56
5 Single phase Transformer	73
6 Electrical Machines	85
7 Semiconductor devices and rectifiers	90

List of Scilab Codes

Exa 1.2	Find Resistance	5
Exa 1.3	Resistance	5
Exa 1.4	Resistance	6
Exa 1.5	Resistance	6
Exa 1.6	Resistance	7
Exa 1.7	Resistance	8
Exa 1.8	Resistance	8
Exa 1.9	Resistance	9
Exa 1.10	Resistance	9
Exa 1.11	Resistance	9
Exa 1.12	Resistance	10
Exa 1.14	Resistance	11
Exa 1.15	Resistance	11
Exa 1.16	Resistance	12
Exa 1.18	Resistance	12
Exa 1.19	Resistance	12
Exa 1.21	Resistance	13
Exa 1.22	Resistance	14
Exa 1.23	Resistance	14
Exa 1.24	Resistance	15
Exa 1.25	Resistance	15
Exa 1.26	Resistance	16
Exa 1.27	Resistance	16
Exa 1.28	Resistance	17
Exa 1.29	Resistance	18
Exa 1.30	Resistance	18
Exa 1.31	Resistance	19
Exa 2.1	Equivalent resistance	21

Exa 2.2	Equivalent resistance	22
Exa 2.3	Equivalent resistance	22
Exa 2.4	Equivalent resistance	23
Exa 2.6	Equivalent resistance	24
Exa 2.7	Equivalent resistance	25
Exa 2.9	Find current	26
Exa 2.10	Find current through 2ohm resistor	26
Exa 2.11	Determine current through 5 ohm resistor	26
Exa 2.12	Find current supplied by the battery	27
Exa 2.13	Determine voltage	27
Exa 2.14	Find current through 2ohm resistor	27
Exa 2.15	Find current through 10 ohm resistor	28
Exa 2.16	Find current in 3 ohm resistor	28
Exa 2.17	Find current in 5 ohm resistor	29
Exa 2.19	Find voltage at nodes 1 and 2	29
Exa 2.20	Find Va and Vb	29
Exa 2.21	Calculate the current through the 5 ohm resistor	30
Exa 2.23	Find Va and Vb	30
Exa 2.24	Find voltage across 5 ohm resistor	31
Exa 2.25	Find currents I1 I2 and I3	31
Exa 2.26	Find currents and voltages	31
Exa 2.27	Find current in the 10 ohm resistor	32
Exa 2.28	Find V1 and V2	32
Exa 2.29	Find voltage across the 100 ohm resistor	33
Exa 2.30	Find current through the 4 ohm resistor	33
Exa 2.31	Find current through the 4 ohm resistor	34
Exa 2.42	Find the current between the 2 ohm resistor connected btw A and B	34
Exa 2.43	Find the current through the 10 ohm resistor	34
Exa 2.44	Find the current through the 10 ohm resistor	35
Exa 2.45	Find the current through the 40 ohm resistor	35
Exa 2.46	Find the current through the 10 ohm resistor	36
Exa 2.47	Find current through the 24 ohm resistor	36
Exa 2.49	Find the current through the 20 ohm resistor	37
Exa 2.50	Find the current through the 3 ohm resistor	37
Exa 2.51	Find the current through the 30 ohm resistor	38
Exa 2.53	Find the current through the 20 ohm resistor	38
Exa 2.54	Find the current through the 5 ohm resistor	39

Exa 2.55	Find the current through the 10 ohm resistor	40
Exa 2.56	Find current through the 1 ohm resistor	41
Exa 2.57	Find current in the 10 ohm resistor	41
Exa 2.58	Find current in the 10 ohm resistor	42
Exa 2.59	Find the current through the 10 ohm resistor	42
Exa 2.60	Find current through 10 ohm resistor	43
Exa 2.61	Find current in the 10 ohm resistor	43
Exa 2.62	Nortons equivalent	44
Exa 2.63	Find current through the 8 ohm resistor	44
Exa 2.64	Find current through the 1 ohm resistor	45
Exa 2.65	Find max power	45
Exa 2.66	Find max power	46
Exa 2.67	Find max power	46
Exa 2.68	Find R_l and calculate maximum power	47
Exa 2.69	Find R_l and calculate max power	48
Exa 2.70	Find R_l and max power	48
Exa 2.71	Max power	49
Exa 3.1	Mean value of current	50
Exa 3.2	Time at which current attain a particular value	50
Exa 3.3	Time at which current attain a particular value	51
Exa 3.4	Time at which current attain a particular value	51
Exa 3.5	Time at which current attain a particular value	52
Exa 3.6	Time at which current attain a particular value	52
Exa 3.8	Time at which current attain a particular value	53
Exa 3.10	Time at which current attain a particular value	53
Exa 3.15	Form factor Frequence and Crest Factor	54
Exa 3.16	RMS value and maximum value	54
Exa 3.17	Average value and RMS value of voltage	55
Exa 4.1	Calculation of Z	56
Exa 4.2	Calculation of Z	57
Exa 4.3	Calculation of active power reactive power and total power	58
Exa 4.4	Calculation of P	59
Exa 4.5	Calculation of different powers for line and phase voltages	60
Exa 4.6	Calculation of different powers for line and phase voltages	62
Exa 4.7	Calculation of different powers for line and phase voltages	64
Exa 4.8	Calculation of P	65

Exa 4.9	Calculation of active power reactive power and total power	66
Exa 4.11	Calculation of phase resistance and phase impedance .	67
Exa 4.13	Calculation of phase resistance and phase reactance . .	68
Exa 4.14	Calculation of Q	69
Exa 4.17	Calculation of active and reactive components of phase current	70
Exa 4.20	Calculation of P	71
Exa 5.1	Example number 1	73
Exa 5.2	Example number 2	73
Exa 5.3	Example number 3	74
Exa 5.4	Example number 4	74
Exa 5.5	Example number 5	75
Exa 5.6	Example 6	75
Exa 5.7	Example 7	76
Exa 5.8	Example number 8	76
Exa 5.9	Example number 9	77
Exa 5.11	Example number 11	77
Exa 5.12	Example number 12	78
Exa 5.13	Example number 13	79
Exa 5.15	Example number 15	79
Exa 5.17	Example number 17	80
Exa 5.18	Example number 18	81
Exa 5.19	Example number 19	81
Exa 5.20	Example number 20	82
Exa 5.21	Example number 21	83
Exa 5.22	Example number 22	83
Exa 5.23	Example number 23	84
Exa 5.28	Example number 28	84
Exa 6.1	Example 1	85
Exa 6.2	Example number 2	85
Exa 6.3	Example number 3	86
Exa 6.4	Example number 4	86
Exa 6.5	Example number 5	87
Exa 6.6	Example number 6	88
Exa 6.7	Example number 7	88
Exa 7.1	Calculation of base current	90
Exa 7.2	Calculation of alpha dc	90

Exa 7.4	Calculation of collector current	91
Exa 7.5	Calculation of emitter current	91
Exa 7.6	Calculation of base current	91
Exa 7.7	Calculation of base current	92
Exa 7.13	Calculation of I_{dc}	92
Exa 7.14	Calculation of peak value of current	93
Exa 7.16	Calculation of V_{rms}	93
Exa 7.17	Calculation of percent regulation	93
Exa 7.18	To find out voltage across conducting diode	94
Exa 7.19	Percentage regulation	95
Exa 7.21	Peak inverse voltage	96

Chapter 1

Basic Circuit Concepts

Scilab code Exa 1.2 Find Resistance

```
1 //Chapter 1,Example 1.2,Pg 1.10
2 clc;
3 l=2000*10^3 //length of the cable in metres
4 d=0.7*10^-2 //diameter of the cable in metres
5 p=(1/58)*10^-6 //ohms per m for 1sq mm cross
   sectional area
6 A=(%pi*d^2)/4
7 R=(p*l)/A
8 printf("\n Resistance = %.2f ohms \n",R)
```

Scilab code Exa 1.3 Resistance

```
1 //Chapter1 ,Example1.3 ,Pg1.10
2 printf("\n Diameter of wire=d\n")
3 printf("\n Length of wire=l\n")
4 printf("\n Resistance of wire = 4pl/A\n")
5 printf("\n For another wire diameter =2d\n")
6 printf("\n length =4l\n")
```

```
7 printf("\n Hence Resistance = 4pl/A")
8 printf("\n Hence Resistance = R\n")
```

Scilab code Exa 1.4 Resistance

```
1 //Chapter1 ,Example1.4 ,Pg1.10
2 clc;
3 l1=100 //length of the wire in metres
4 A1=0.1*10^-6 //area of the wire in metres
5 p=50*10^-8 //resistivity of the wire in ohm metre
6 R1=p*l1/A1
7 printf("\n Resistance before drawing out the wire =
   %1f ohms\n",R1)
8 printf("\n Volume of the wire before drawing out=
   Volume of the wire after drawing out \n")
9 A2=A1/3
10 l2=3*l1
11 R2=p*l2/A2
12 printf("\n Resistance after drawing out = %1f ohms \
   n",R2)
13 a=R2/R1
14 printf("\n The Ratio of the resistances is = %1f \n"
   ,a)
```

Scilab code Exa 1.5 Resistance

```
1 clc;
2 //Chapter 1,Example 1.5 ,Pg 1.11
3 printf("\n For silver wire R1 = (p1 X l1)/A1 \n")
4 printf("\n For Manganin wire R2= (p1 X l2)/A2 \n")
5 printf("R2/R1 = (p2 X l2 X A1)/(p1 X l1 X A2)\n")
6 R1=2 //resistance of silver wire in ohms
```

```

7 d1=1 //assuming the diameter of the silver wire to
    be 1 unit
8 d2=d1/3
9 l1=1 //assuming the length of the silver wire to be
    1 unit
10 l2=l1/3
11 p1=1 //assuming the resistivity of silver wire is 1
    unit
12 p2=30*p1
13 A1=%pi*d1^2/4
14 A2=%pi*d2^2/4
15 R2=p2*l2/A2
16 Rone=p1*l1/A1
17 R=R2/Rone
18 R2=R1*R
19 printf("\n Resistance of manganin wire = %.0f ohms\n
    ",R2)

```

Scilab code Exa 1.6 Resistance

```

1 //Chapter 1,Example 1.6 ,Pg 1.11
2 clc;
3 R10=80 //Resistance at 10 degrees Celsius
4 R60=96.6 //Resistance at 60 degrees Celsius
5 disp("R10=R0(1 + 10a0)")
6 disp("R60=R0(1 + 60a0)")
7 disp("Divide both the equations")
8 disp("96.6/80 = (1 +60a0)/(1+10a0)")
9 a0=(96.6-80)/(4800-966)
10 at=a0/(1+a0*60)
11 printf("\n Temp coeff at 60 degrees= %1f per degree
    C\n",at)

```

Scilab code Exa 1.7 Resistance

```
1 //Chapter1,Example 1.7,Pg1.12
2 function[at]=a0toat(a0)
3     t=temp;
4     at=a0/(1+a0*t)
5 endfunction
6 function[a0]=attoa0(at)
7     t=temp;
8     a0=at/(1-at*t)
9 endfunction
10 clc;
11 at=1/254.5 //given
12 temp=20 //temperature
13 a00=attoa0(at) //storing the returned temperature
    coefficient in variable a00
14 printf("\n Temp coeff = %.6f per degree C \n",a00)
15 temp=60
16 at1=a0toat(a00)
17 printf("\n Temp coeff at 60 degress = %8f per degree
    C \n",at1)
```

Scilab code Exa 1.8 Resistance

```
1 //Chapter 1,Example 1.8,Pg 1.12
2 clc;
3 disp("We know that  $R1 = R0(1+a0t)$ ")
4 disp("At  $t1=20$  degree C,  $R1=45$  ohms")
5  $R0=45/(1+0.004*20)$ 
6 disp("At  $t2$ ,  $R2=48.5$  ohms")
7 disp("Therefore, we can calculate  $t2$  as follows")
8 disp(" $45/48.5 = (1+0.004*20)/(1+0.004t2)$ ")
9  $t2=(48.5-R0)/(0.004*R0)$ 
10 printf("\n Therefore  $t2= %.0f$  degree C \n",t2)
```

Scilab code Exa 1.9 Resistance

```
1 //Chapter 1, Example 1.9, Pg 1.13
2 clc;
3 disp("We know that  $R_t = R_0(1+a_0*t)$ ")
4 disp("At  $t_1=20$  degree C,  $R_1=18$  ohms")
5 disp("18= $R_0(1+20*a_0)$ ")
6 disp("At  $t_2=50$  degree C  $R_2=20$  ohms")
7 disp("20= $R_0(1+50*a_0)$ ")
8  $a_0=20-18/(900-400)$  //Divide both the equations
9 printf("\n  $a_0=$ %.3f per degree c \n",  $a_0$ )
10  $t=(21+1.68-18)/0.072$ 
11 printf("\n Therefore temp  $t =$  %.0f degrees C \n",  $t$ )
```

Scilab code Exa 1.10 Resistance

```
1 //Chapter 1, Example 1.10, Pg1.13
2 clc;
3  $R_{a0}=120$ 
4  $R_{b0}=180$ 
5  $A_a=0.0035$ 
6  $A_b=0.008$ 
7  $A=(R_{a0}*A_a+R_{b0}*A_b)/(R_{a0}+R_{b0})$ 
8 printf("\n The series combination of the two = %.4f
per degree C\n",  $A$ )
```

Scilab code Exa 1.11 Resistance

```
1 //Chapter1, Example1.11, Pg1.14
```

```

2 function [R2] = myfunction(R1)
3     temp1=t1
4     temp2=t2
5     a=a0
6     R2=R1*(1+a0*(temp2-temp1))
7 endfunction
8 function [alpha]=coefficient(a1)
9     temp1=t1
10    temp2=t2
11    alpha=a1/(1+a1*(temp2-temp1))
12 endfunction
13 clc;
14 t1=30
15 t2=50
16 a0=0.003
17 A1=coefficient(a0)
18 r1=myfunction(150)
19 a0=0.002
20 A2=coefficient(a0)
21 r2=myfunction(350)
22 printf("\n Series combination=%0.0f ohms \n",r1+r2)
23 printf("\n Parallel combination=%0.2f ohms \n",r1*r2
    /(r1+r2))
24 printf("\n For first coil a50=%0.4f per degree C \n",
    A1)
25 printf("\n For second coil a50=%0.5f per degree C \n"
    ,A2)

```

Scilab code Exa 1.12 Resistance

```

1 //Chapter1 , Example1.12 , Pg1.17
2 clc;
3 disp("When a wire is bent in the form of a circle ,
    its resistance gets divided between any two
    points on its diameter as the resistance is

```

directly proportional to its length. The two parts can be considered as two resistors of 6ohms in parallel")

```

4 R=6*6/(6+6)
5 printf("\n Hence equivalent resistance R=%0.0f ohms \
n",R)

```

Scilab code Exa 1.14 Resistance

```

1 //Chapter1 ,Example 1.14 ,Pg1.18
2 clc;
3 disp("Refer to the figure shown in the problem")
4 R=1/((1/25)+(1/50)+(1/50))+2+8
5 printf("\n Equivalent resistance between A and B = %
.1f ohms \n",R)

```

Scilab code Exa 1.15 Resistance

```

1 //Chapter1 ,Example1.15 ,Pg1.19
2 clc;
3 disp("Refer to the figure shown in the problem")
4 R1=4*4/(4+4) //Equivalent resistance of the upper
triangular network
5 R2=3*3/(3+3) //Equivalent resistance of the
triangular network on right
6 R3=2*(R1+R2)/(2+R1+R2)
7 R=2*(R3+1)/(2+R3+1)
8 printf("\n Equivalent resistance =%0.2f ohms \n",R)
9 I=30/R
10 printf("\n Current=%0.1f A \n",I)

```

Scilab code Exa 1.16 Resistance

```
1 //Chapter1 ,Example 1.16 ,Pg1.20
2 clc;
3 disp("Refer to the figure given in the problem")
4 R1=4*4/(4+4) //Equivalent resistance of the upper
   triangle shown in the figure obtained by the
   reduction of the upper left and right triangular
   resistance networks
5 R2=3*3/(3+3)
6 R3=(2*(R1+R2))/(2+R1+R2)
7 R=1/((1/5)+(1/2)+(1/(R3+1)))
8 printf("\n Equivalent resistance =%.2f ohms \n",R)
9 I=50/R
10 printf("\n Current = %.2f A \n",I)
```

Scilab code Exa 1.18 Resistance

```
1 //Chapter1 ,Example 1.18 ,Pg 1.23
2 clc;
3 I=30/15
4 disp("Refer to the diagram given in the question")
5 printf("\n Current through the 15 ohm resistor is
   given by I= 30/15 = %.0f A \n",I)
6 printf("Current through the 5 ohm resistance = 5+2=
   %.0f A",5+2)
7 disp("Applying KVL to the closed path and thus
   obtaining the result we can say")
8 disp("-5(7)-R(I)+100-30=0")
9 R=(100-30-35)/2
10 printf("\n R= %.1f ohms \n",R)
```

Scilab code Exa 1.19 Resistance

```

1 //Chapter 1,Example 1.19,Pg 1.24
2 clc;
3 disp("Refer to the figure shown in the diagram")
4 disp("Assign branch currents as shown in the figure"
    )
5 disp("I2-I3=13")
6 disp("-20I1+8I2=0")
7 disp("-12I1-16I2=0")
8 disp("By solving the equations we can obtain the
    result as follows")
9 A=[0 1 -1;-20 8 0;-12 0 -16]
10 B=[13;0;0]
11 I=A\B
12 printf("\n I1= %.0f A \n",I(1,:))
13 printf("\n I2= %.0f A \n",I(2,:))
14 printf("\n I3= %.0f A \n",I(3,:))

```

Scilab code Exa 1.21 Resistance

```

1 //Chapter 1,Example 1.21,Pg1.26
2 clc;
3 disp("Refer to the figure shown in the question")
4 disp("Let the branch current be as follows")
5 disp("IOA=x")
6 disp("IOB=1-x")
7 disp("IAB=y")
8 disp("IBC=1-x-y")
9 disp("IAC=x+y")
10 A=[3 -3;9 12]
11 B=[2;4]
12 XY= A\B
13 x=XY(1,1)
14 y=XY(2,1)
15 IOA=x
16 IOB=1-x

```

```

17 IAB=y
18 IBC=1-x-y
19 IAC=x+y
20 printf("\n IOA=%0.2 f A \n",IOA)
21 printf("\n IOB=%0.2 f A \n",IOB)
22 printf("\n IAB=%0.3 f A \n",IAB)
23 printf("\n IBC=%0.3 f A \n",IBC)
24 printf("\n IAC=%0.3 f A \n",IAC)

```

Scilab code Exa 1.22 Resistance

```

1 //Chapter 1,Example1.26 ,Pg1.22
2 clc;
3 disp("Refer to the figure shown in the question")
4 I1=2/5
5 I2=4/8
6 printf("\n I1= %0.1 f A \n",I1)
7 printf("\n I2=%0.1 f A \n",I2)
8 Vxy=3*I2-3*I1-4
9 printf("\n Vxy=%0.1 f V",Vxy)

```

Scilab code Exa 1.23 Resistance

```

1 //Chapter 1,Example 1.23 ,Pg1.27
2 clc;
3 disp("Refer to the figure shown in the diagram")
4 I1=20/15 //Voltage in the loop divided by the sum of
           resistances
5 I2=15/10 //Voltage in the loop divided by the sum of
           resistances
6 printf("\n I1=%0.2 f A \n",I1)
7 printf("\n I2=%0.1 f A \n",I2)
8 Vab=5*I1-6*I2+5+15 //By applying KVL to the loop

```

```
9 printf("\n Vab=%0.2 f V" ,Vab)
```

Scilab code Exa 1.24 Resistance

```
1 //Chapter 1,Example1.24 ,Pg1.27
2 clc;
3 disp("Refer to the figure shown in the problem")
4 I1=5/2 //The 3ohms resistance gets shorted hence
        current flows only through the 2 ohms resistor
5 I2=2
6 printf("\n I1=%0.1 f A \n" ,I1)
7 printf("\n I2=%0.0 f A \n" ,I2)
8 Vab=2*I1-8+5*I2
9 printf("\n Vab=%0.0 f V \n" ,Vab)
```

Scilab code Exa 1.25 Resistance

```
1 //Chapter 1,Example1.25 ,Pg1.28
2 clc;
3 disp("Refer to the figure shown in the problem")
4 I1=10/8 //Voltage divided by the sum of the
        resistances
5 I2=5 //Current in the second loop is indicated by a
        current source of 5A
6 printf("\n I1=%0.2 f A \n" ,I1)
7 printf("\n I2=%0.0 f A \n" ,I2)
8 //Apply KVL to the path from A to B
9 Vab=3*I1+8-3*I2
10 printf("\n Vab=%0.2 f V \n" ,Vab)
```

Scilab code Exa 1.26 Resistance

```
1 //Chapter1 ,Ex1.26 ,Pg1.29
2 function [current1] = voltagetocurrent(voltage1)
3     resistance1=R
4     current1=voltage1/resistance1
5 endfunction
6 function [voltage2]=currenttovoltage (current2)
7     resistance2=R
8     voltage2=current2*resistance2
9 endfunction
10 clc;
11 disp("Refer to the figure shown in the question")
12 R=5 //Resistance in ohms
13 I1=voltagetocurrent(20) //Converting voltage source
    with series resistance to current source with
    parallel resistance
14 I=I1+3 //Total of the current sources in the circuit
15 R=1/((1/30)+(1/50)+(1/5)+(1/6)) //Equivalent
    resistance in the circuit
16 V1=currenttovoltage(I) //Converting current source
    with parallel resistance to voltage source with
    series resistance
17 printf("\n Equivalent resistance in network = %.2f
    ohms \n",R)
18 printf("\n Equivalent voltage source in network = %
    .2f V \n",V1)
```

Scilab code Exa 1.27 Resistance

```
1 //Chapter1 ,Example1.27 ,Pg1.30
2 clc;
3 disp("Since the 5 ohms resistor is connected in
    parallel with 20V source ,it becomes redundant")
4 I=20.00/6.00 //Converting 20V in series with 6 ohms
```

```

    to current source in parallel with 6 ohms
5 I=I+10
6 printf("\n Total current in circuit = %.2f A \n",I)
7 printf("Equivalent resistance = %.0f ohms \n",6)

```

Scilab code Exa 1.28 Resistance

```

1 //Chapter1,Example1.28,Pg30
2 function [current1] = voltagecurrent(voltage1)
3     resistance1=R
4     current1=voltage1/resistance1
5 endfunction
6 function [voltage2]=currenttovoltage(current2)
7     resistance2=R
8     voltage2=current2*resistance2
9 endfunction
10 clc;
11 disp("Refer to the figure shown in the diagram")
12 R=3 //Resistance in ohms
13 I1=voltagecurrent(6) //Converting voltage source
    with series resistance to current source with
    parallel resistance
14 R=2
15 I2=voltagecurrent(4)
16 R=1
17 I3=voltagecurrent(3)
18 R1=2*2/(2+2) //Equivalent resistance of upper
    portion
19 R2=3*1/(3+1) //Equivalent resistance of lower
    portion
20 I11=1+I2 //Total current of upper portion
21 I12=-I1+I3 //Total current of lower portion
22 R=R1
23 V1=currenttovoltage(I11)
24 R=R2

```

```

25 V2=currenttovoltage(I12)
26 V=V1+V2
27 R=R1+R2
28 printf("\n Total voltage source = %.2f V \n",V)
29 printf("\n Total equivalent resistance = %.2f ohms \
n",R)

```

Scilab code Exa 1.29 Resistance

```

1 //Chapter1 , Example1.29 , Pg1.32
2 function [current1] = voltagecurrent(voltage1)
3     resistance1=R
4     current1=voltage1/resistance1
5 endfunction
6 function[voltage2]=currenttovoltage(current2)
7     resistance2=R
8     voltage2=current2*resistance2
9 endfunction
10 clc;
11 disp("Refer to the diagram shown in the figure")
12 R=3 //Resistance in ohms
13 I=voltagecurrent(10)
14 I=I+10 //Total current in the circuit
15 R=3*2/(3+2)
16 V=currenttovoltage(13.33)
17 I=(50-16)/(5+1.2) //Current in the circuit
18 P=50*I //Power delivered by the 50V source
19 printf("\n Power delivered by the 50V source=%.0f W
n",P)

```

Scilab code Exa 1.30 Resistance

```

1 //Chapter1 , Example1.30 , Pg1.32

```

```

2 function [current1] = voltagecurrent(voltage1)
3     resistance1=R
4     current1=voltage1/resistance1
5 endfunction
6 function [voltage2]=currenttovoltage(current2)
7     resistance2=R
8     voltage2=current2*resistance2
9 endfunction
10 clc;
11 disp("Refer to the figure shown in the problem")
12 R=2 //Resistance in ohms
13 V=currenttovoltage(5) //Converting current source
    with parallel resistance to voltage source with
    series resistance
14 V=V-6 //Equivalent resistance in the closed path
15 I=voltagecurrent(V) //Converting voltage source
    with series resistance to current source with
    parallel resistance
16 I=I+2 //Total current provided by combination of
    current sources in circuit
17 I4=I*2/(2+4) //Current through the 4 ohm resistance
18 printf("\n Current through the 4 ohm resistance = %
    .2f A \n",I4)

```

Scilab code Exa 1.31 Resistance

```

1 //Chapter1 ,Example1.31 ,Pg1.33
2 function [current1] = voltagecurrent(voltage1)
3     resistance1=R
4     current1=voltage1/resistance1
5 endfunction
6 function [voltage2]=currenttovoltage(current2)
7     resistance2=R
8     voltage2=current2*resistance2
9 endfunction

```



```

10 clc;
11 disp("Refer to the figure shown in the diagram")
12 disp("Since nodes 1 and 2 are maintained at the same
        voltage by the sources , the connection between
        nodes 1 and nodes 2 is removed. Now the two
        voltage sources have resistors in series and
        source transformation can be applied")
13 R=4 //Resistance in ohms
14 I=voltagecurrent(18) //Converting voltage source
        with series resistance to current source with
        parallel resistance
15 R=4*2/(4+2) //Since the 4 ohm and 2 ohm resistances
        are in parallel
16 V=currenttovoltage(I) //Converting current source
        with parallel resistance to voltage source with
        series resistance
17 Va=(6+(5.985/2.33))/((1/3)+(1/2.33)+(1/6))
18 printf("\\n Voltage at node A = %.2f V \\n",Va)

```

Chapter 2

DC CIRCUITS

Scilab code Exa 2.1 Equivalent resistance

```
1 //Chapter 2,Ex 2.1,Pg 2.4
2 function [resistance_1] = deltastar(R)
3     resistance1=R1
4     resistance2=R2
5     resistance_1= (resistance1*resistance2)/R
6 endfunction
7 clc;
8 disp("Refer to the diagram shown in the figure")
9 R1=4.5 //Resistance in ohms
10 R2=7.5 //Resistance in ohms
11 R3=3 //Resistance in ohms
12 R=R1+R2+R3
13 Ra=deltastar(R) //Converting the given delta
    network to star network
14 R2=3 //Resistance in ohms
15 Rb=deltastar(R) //Converting delta network to star
    network
16 R1=7.5
17 Rc=deltastar(R) //Converting delta network to star
    network
18 R_1= 1/((1/(Rb+Rb+4)) + (1/(Rc+Rc+3)))
```

```

19 R_eq=(2*Ra) + R_1 // Equivalent resistance of the
    entire network
20 printf("\n The equivalent resistance R = %.2f ohms \
    n",R_eq)

```

Scilab code Exa 2.2 Equivalent resistance

```

1 //Chapter 2,Ex 2.2,Pg 2.5
2 function [resistance_1] = deltatostar(R)
3 resistance1=R1
4 resistance2=R2
5 resistance_1= (resistance1*resistance2)/R
6 endfunction
7 clc;
8 disp("Refer to the diagram shown in the problem")
9 R1=10 //Resistance in ohms
10 R2=10 //Resistance in ohms
11 R3=10 //Resistance in ohms
12 R=R1+R2+R3
13 Ra=deltatostar(R) //Converting the delta network to
    star network of resistances. All the resistances
    in the star network will be the same as the
    resistances in the delta network have the same
    value
14 R_1= 1/(1/(Ra+10) + 1/(Ra+10))
15 R_eq=Ra+R_1
16 printf("\n The equivalent resistance R= %.0f ohms\n"
    ,R_eq)

```

Scilab code Exa 2.3 Equivalent resistance

```

1 //Chapter 2,Ex 2.3,Pg 2.7
2 function [resistance_1] = startodelta(R)

```

```

3     resistance_1= (R1*R + R2*R + R1*R2)/R
4 endfunction
5 clc;
6 disp("Refer to the diagram shown in the figure")
7 R1=6 //One of the Resistances of the star network to
      be converted into delta
8 R2=4 //One of the Resistances of the star network to
      be converted into delta
9 R3=3
10 //To find out individual resistances of the star
     network
11 Ra=startodelta(R3)
12 R3=4
13 R2=3
14 Rb=startodelta(R3)
15 R3=6
16 R1=4
17 Rc=startodelta(R3)
18 R_1= 1/((1/Ra) + (1/9))
19 R_2= 1/((1/Rb)+(1/1.5))
20 R_eq= 1/((1/6) + (1/(R_2+0.9)))
21 printf("\n Equivalent resistance R= %.2f ohms\n",
        R_eq) //Equivalent resistance of the circuit

```

Scilab code Exa 2.4 Equivalent resistance

```

1 //Chapter 2,Ex2.4,Pg 2.8
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 R=6+6+6 //Total resistance of the delta network in
      the left part of the circuit
5 r1=6*6/(R) //Delta to star conversion
6 R=15+15+15 //Total resistance of the delta network
      in the right part of the circuit
7 r2=15*15/R

```

```

8 R_1=1/(1/(r1+41+r2) + 1/(r1+17+r2))
9 R_eq=R_1+r1+r2
10 printf("\n The equivalent resistance R = %.0f ohms\n
      ",R_eq)

```

Scilab code Exa 2.6 Equivalent resistance

```

1 //Chapter2 , Ex2.6 ,Pg 2.11
2 function [R] = deltastar(R1,R2,R3,n)
3     Rtotal=R1+R2+R3
4     if(n==1) then
5         R=R1*R2/Rtotal
6     elseif(n==2)
7         R=R2*R3/Rtotal
8     else
9         R=R1*R3/Rtotal
10        end
11 endfunction
12 clc;
13 disp("Refer to the diagram shown in the figure")
14
15 r1=deltastar(20,5,15,1) //Converting delta network
      to star network
16 r3=deltastar(20,5,15,2)
17 r2=deltastar(20,5,15,3)
18 r1'=r1
19 R1=r3+2
20 R2=r2+30
21 r1=deltastar(R1,R2,30,1)
22 r2=deltastar(R1,R2,30,2)
23 r3=deltastar(R1,R2,30,3)
24 Req=1/(1/(r1'+r1+10) + 1/(15+r3)) + r2
25 printf("\n The equivalent resistance R= %.2f ohms\n"
      ,Req)

```

Scilab code Exa 2.7 Equivalent resistance

```
1 //Chapter 2,Ex2.7,Pg2.13
2 function [r_1] = startodelta(r1,r2,r3) //Function
    that converts star network to equivalent delta
    network
3     r_1=ones(1:3)
4     Rtotal=(r1*r3 + r2*r3 + r1*r2)
5     r_1(1)=Rtotal/r1
6     r_1(2)=Rtotal/r2
7     r_1(3)=Rtotal/r3
8 endfunction
9 function [r_2]=deltatostar(r1,r2,r3) //Function that
    converts delta network to equivalent star network
10    Rtotal=r1+r2+r3
11    r_2=ones(1:3)
12    r_2(1)=r1*r2/Rtotal
13    r_2(2)=r2*r3/Rtotal
14    r_2(3)=r1*r3/Rtotal
15    endfunction
16 clc;
17 disp("refer to the figure shown in the diagram")
18 R=startodelta(8,5,3)
19 R_1=R(2)*5/(R(2)+5) //Parallel combination of
    resistances
20 R_2=R(3)*4/(R(3)+4) //Parallel combination of
    resistances
21 R1=deltatostar(R_1,R(1),R_2)
22 Req=1/(1/(6+R1(1)) + 1/(4+R1(2))) +R1(3)
23 printf("\n The equivalent resistance R= %.2f ohms\n"
    ,Req)
```

Scilab code Exa 2.9 Find current

```
1 //Chapter 2,Ex2.9,Pg 2.18
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[10 -3 -6;-3 10 0;-6 0 10]
5 B=[10; -5; 25]
6 I=A\B
7 printf("\n Current through the 5 ohms resistor=%0.2f
   A\n",I(2))
```

Scilab code Exa 2.10 Find current through 2ohm resistor

```
1 //Chapter 2,Ex2.10,Pg 2.19
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[7 -1 0 ;-1 6 -3; 0 -3 13]
5 B=[10; 0; -20]
6 I=A\B
7 printf("\n Current through the 2 ohms resistor=%0.2f
   A\n",I(2))
```

Scilab code Exa 2.11 Determine current through 5 ohm resistor

```
1 //Chapter 2,Ex2.11,Pg 2.20
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[3 -1 -2 ;-1 8 -3; -2 -3 10]
5 B=[8; 10; 12]
6 I=A\B
7 printf("\n Current through the 5 ohms resistor=%0.2f
   A\n",I(3))
```

Scilab code Exa 2.12 Find current supplied by the battery

```
1 //Chapter 2,Ex2.12 ,Pg 2.21
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[8 -1 -4 ;-1 8 -5; -4 -5 15]
5 B=[4; 0; 0]
6 I=A\B
7 printf("\n Current supplied by battery=%0.2f A\n",I
  (1))
```

Scilab code Exa 2.13 Determine voltage

```
1 //Chapter 2,Ex2.13 ,Pg 2.22
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[1 -2 -5 ;0 -6 1; 1 1 -10]
5 B=[20; 0; 0]
6 VI=A\B
7 printf("\n Current supplied by battery=%0.1f A\n",VI
  (1))
```

Scilab code Exa 2.14 Find current through 2ohm resistor

```
1 //Chapter 2,Ex2.14 ,Pg 2.22
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[1 0 0 ;0 18 -6; 0 6 -11]
5 B=[6; 108; 9]
```



```

6 I=A\B
7 printf("\n Current through 2 ohms resistor=%0.0f A\n"
      ,I(3))

```

Scilab code Exa 2.15 Find current through 10 ohm resistor

```

1 //Chapter 2,Ex2.15 ,Pg2.23
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 a=[11 -10 0;0 -1 1;2 -3 -3]
5 b=[2;4;0]
6 i=a\b
7 printf("\n I1 = %0.2f A\n",i(1))
8 printf("\n I2 = %0.2f A\n",i(2))
9 printf("\ I3=%0.2f A\n",i(3))
10 printf("\n Current through 10 ohms resistor = %0.2f A
      \n",i(1)-i(2))

```

Scilab code Exa 2.16 Find current in 3 ohm resistor

```

1 //Chapter 2,Ex2.16 ,Pg2.24
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 a=[1 0 -1;-1 4 -4;1 -6 3]
5 b=[7;-7;0]
6 i=a\b
7 printf("\n I1 = %0.1f A\n",i(1))
8 printf("\n I2 = %0.1f A\n",i(2))
9 printf("\ I3=%0.0f A\n",i(3))
10 printf("\n Current through 3 ohms resistor = %0.1f A\
      n",i(2)-i(3))

```

Scilab code Exa 2.17 Find current in 5 ohm resistor

```
1 //Chapter 2,Ex2.16 ,Pg2.24
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 a=[15 -10 -5;0 1 -1;-15 12 6]
5 b=[50;2;0]
6 i=a\b
7 printf("\n I1 = %.0f A\n",i(1))
8 printf("\n I2 = %.2f A\n",i(2))
9 printf("\n I3=%.2f A\n",i(3))
10 printf("\n Current through 5 ohms resistor = %.1f A\n",i(1)-i(3))
```

Scilab code Exa 2.19 Find voltage at nodes 1 and 2

```
1 //Chapter2 ,Ex2.20 ,Pg 2.26
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 a=[2 -1;-1 3]
5 b=[2;4]
6 v=a\b
7 printf("\n V1=%.0f V\n",v(1))
8 printf("\n V2=%.0f V\n",v(2))
```

Scilab code Exa 2.20 Find Va and Vb

```
1 //Chapter2 ,Ex2.20 ,Pg2.27
2 clc;
```

```

3 disp("Refer to the diagram shown in the figure")
4 a=[8 -2;-3 9]
5 b=[50;85]
6 v=a\b
7 printf("\n Va=%0.2 f V\n",v(1))
8 printf("\n Vb=%0.2 f V\n",v(2))

```

Scilab code Exa 2.21 Calculate the current through the 5 ohm resistor

```

1 //Chapter2 ,Ex2.21 ,Pg2.27
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 a=[5 -2 0;10 -31 6;0 -4 9]
5 b=[-24;300;160]
6 v=a\b
7 printf("\n V1=%0.2 f V\n",v(1))
8 printf("\n V2=%0.2 f V\n",v(2))
9 printf("\n V3=%0.2 f V\n",v(3))
10 printf("\n Current through 5 ohms resistor = %0.2 f A\n",
    (v(3)-v(2))/5)

```

Scilab code Exa 2.23 Find Va and Vb

```

1 //Chapter 23,Ex 2.23 ,Pg2.29
2 clc;
3 disp("Refer to the diagram given in the question")
4 A=[4 -2;-2 3]
5 B=[5;4]
6 V=A\B
7 printf("\n Va=%0.2 f V\n",V(1))
8 printf("\n Vb=%0.2 f V\n",V(2))

```

Scilab code Exa 2.24 Find voltage across 5 ohm resistor

```
1 //Chapter 2,Example 2.24,Pg 2.30
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[4 -2 -1;-50 71 -20;-5 -4 10]
5 B=[-24;0;180]
6 V=A\B
7 printf("\n Va=%0.2 f V\n",V(1))
8 printf("\n Vb=%0.2 f V\n",V(2))
9 printf("\n Vc=%0.2 f \n",V(3))
10 printf("\n Voltage across 5 ohms resistor=%0.2 f \n",V
    (3)-V(2))
```

Scilab code Exa 2.25 Find currents I1 I2 and I3

```
1 //Chapter2 ,Ex2.25 ,Pg2.30
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[8 -1;-2 17]
5 B=[50;-500]
6 V=A\B
7 printf("\n V1=%0.2 f V \n",V(1))
8 printf("\n V2=%0.2 f V \n",V(2))
9 printf("\n I1=%0.2 f \n",-V(1)/2)
10 printf("\n I2=%0.2 f \n", (V(1)-V(2))/10)
11 printf("\n I3=%0.2 f \n", (V(2)+50)/2)
```

Scilab code Exa 2.26 Find currents and voltages

```

1 //Chapter 2,Ex2.26 ,Pg 2.31
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[0.5 -0.2;0.1 -0.4]
5 B=[34.2;-32.4]
6 V=A\B
7 printf("\n Va=%0.2 f V \n",V(1))
8 printf("\n Vb=%0.2 f V \n",V(2))
9 printf("\n I1=%0.0 f A \n", (120-V(1))/0.2)
10 printf("\n I2=%0.0 f A \n", (V(1)-V(2))/0.3)
11 printf("\n I3=%0.0 f A \n", (110-V(2))/0.1)

```

Scilab code Exa 2.27 Find current in the 10 ohm resistor

```

1 //Chapter 2,Ex2.27 ,Pg 2.33
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[1 0;-2 17]
5 B=[50;50]
6 V=A\B
7 printf("\n V1=%0.0 f V \n",V(1))
8 printf("\n V2=%0.2 f V \n",V(2))
9 printf("\n Current in the 10 ohms resistor = %0.2 f A\n",V(2)/10)

```

Scilab code Exa 2.28 Find V1 and V2

```

1 //Chapter 2,Example 2.28 ,Pg 2.33
2 clc;
3 disp("Refer to diagram shown in the diagram")
4 A=[6 -5 0;-10 17 -5;0 0 1]
5 B=[-20;0;20]
6 V=A\B

```

```

7 printf("\n Va=%0.2 f V \n",V(1))
8 printf("\n Vb=%0.2 f V \n",V(2))
9 printf("\n Vc=%0.0 f V \n",V(3))
10 printf("\n V1=%0.2 f V \n",V(1)-V(2))
11 printf("\n V2=%0.2 f V \n",V(2)-V(3))

```

Scilab code Exa 2.29 Find voltage across the 100 ohm resistor

```

1 //Chapter 2,Ex2.29 ,Pg 2.33
2 clc;
3 disp("Refer to the figure shown in the diagram")
4 A=[1 0 0;-1 3 -1;-2 -5 10]
5 B=[60;12;24]
6 V=A\B
7 printf("\n Voltage across the 100 ohms resistor=%0.2 f
      V\n",V(3))

```

Scilab code Exa 2.30 Find current through the 4 ohm resistor

```

1 //Chapter 2,Ex2.30 ,Pg2.34
2 clc;
3 disp("Refer to the figure shown in the diagram")
4 A=[1 -1;2 1]
5 B=[6;28]
6 V=A\B
7 printf("\n V1=%0.2 f V\n",V(1))
8 printf("\n V2=%0.2 f V\n",V(2))
9 printf("\n Current through the 4 ohms resistor=%0.2 f\
      n",V(2)/4)

```

Scilab code Exa 2.31 Find current through the 4 ohm resistor

```
1 //Chapter 2,Example 2.31,Pg2.35
2 clc;
3 disp("Refer to the figure shown question")
4 A=[1 0 -1;2 -2 1;-5 7 0]
5 B=[8; -12; 80]
6 V=A\B
7 printf("\n V1=%0.0 f V \n",V(1))
8 printf("\n V2=%0.0 f V \n",V(2))
9 printf("\n V3=%0.0 f V \n",V(3))
10 printf("\n Current through the 4 ohms resistor= %0.0 f
    A \n",V(3)/4)
```

Scilab code Exa 2.42 Find the current between the 2 ohm resistor connected btw A and B

```
1 //Chapter 2,Ex2.42 ,Pg2.53
2 clc;
3 disp("Refer to the diagram shown in the question")
4 A=[14 -12;-12 16] //Apply KVL theorem to obtain the
    required result
5 B=[2; -4]
6 I=A\B
7 Vth=3*I(2)+4 //Thevenin voltage
8 printf("\n Vth=%0.1 f \n",Vth)
9 R1=((2*12)/(2+12))+1
10 Rth=R1*3/(R1+3)
11 Iload=Vth/(Rth+2)
12 printf("\n I1=%0.2 f \n",Iload)
```

Scilab code Exa 2.43 Find the current through the 10 ohm resistor

```

1 //Chapter 2,Example2.43,Pg 2.54
2 clc;
3 disp("Refer to the diagram shown in the question")
4 A=[7 -1;1 -6]
5 B=[10;0]
6 I=A\B
7 Vth=(3*I(2))-20
8 printf("\n Vth=%.2 f V \n",Vth)
9 R1=[((6*1)/(6+1))+2]
10 Rth=R1*3/(R1+3)
11 printf("\n Rth=%.2 f A \n",Rth)
12 I1=Vth/(Rth+10)
13 printf("\n The value of load current = %.2 f A \n",I1
)

```

Scilab code Exa 2.44 Find the current through the 10 ohm resistor

```

1 //Chapter 2,Example 2.44<pg2.55
2 clc;
3 disp("Refer to the diagram shown in the question")
4 //It can found out by looking at the figure that I1
=10A
5 I2=100/50 //Applying KVL
6 Vth=(5*10)-(20*I2)
7 Rth=5+(20*30/(20+30))
8 Iload=10/(Rth+10)
9 printf("\n Rth=%.0 f ohms\n",Rth)
10 printf("\n I1=%.2 f A\n",Iload)

```

Scilab code Exa 2.45 Find the current through the 40 ohm resistor

```

1 //Chapter 2,Ex45 ,Pg2.56

```



```

2 //Since the 20 ohms resistor is connected across the
   25V source, the resistor becomes redundant
3 I=35/60
4 Vth=(10*I)-10
5 printf("\n Vth=%0.1 f V \n",Vth)
6 Rth=50*10/(50+10)
7 printf("\n Rth=%0.2 f ohms \n",Rth)
8 I1=Vth/(Rth+40)
9 printf("\n Iload=%0.2 f A \n",I1)

```

Scilab code Exa 2.46 Find the current through the 10 ohm resistor

```

1 //Chapter 2,Ex2.46 ,Pg2.57
2 clc;
3 disp("Refer to the diagram shown in the question")
4 I1=50/10
5 I2=20/20
6 Vth=(4*I1)+2-(15*I2)
7 printf("\n Vth=%0.0 f V \n",Vth)
8 Rth=(6*4/(6+4))+(5*15/(5+15))
9 printf("\n Rth=%0.2 f ohms \n",Rth)
10 I1=7/(Rth+10)
11 printf("\n Iload=%0.2 f \n",I1)

```

Scilab code Exa 2.47 Find current through the 24 ohm resistor

```

1 //Chapter2 ,Ex2.47 ,Pg2.58
2 clc;
3 disp("Refer to the diagram shown in the question")
4 I1=220/(30+50)
5 I2=220/(20+5)
6 printf("\n I1=%0.2 f A \n",I1)
7 printf("\n I2=%0.2 f A \n",I2)

```

```

8 Vth=(20*I2)-(30*I1)
9 printf("\n Vth=%0.1 f V \n",Vth)
10 Rth=(30*50/(30+50))+(20*5/(20+5))
11 printf("\n Rth=%0.2 f ohms \n",Rth)
12 I1=Vth/(Rth+24)
13 printf("\n Iload=%0.0 f A \n",I1)

```

Scilab code Exa 2.49 Find the current through the 20 ohm resistor

```

1 //Chapter 2,Ex2.49 ,Pg2.61
2 clc;
3 disp("Refer to the diagram shown in the question")
4 A=[30 -15;-15 20]
5 B=[-75;20]
6 I=A\B
7 printf("\n I1=%0.1 f A \n",I(1))
8 printf("\n I2=%0.1 f A \n",I(2))
9 Vth=45-(10*(I(1)-I(2))) //Thevenin Voltage
10 printf("\n Vth =%0.0 f V \n",Vth)
11 //Converting the delta formed by the resistances
    into star network
12 R1=10*5/(10+5+5)
13 R2=10*5/(10+5+5)
14 R3=5*5/(10+5+5)
15 Rth=((R3+15)*2.5/(R3+15+2.5))+2.5
16 printf("\n Rth=%0.2 f ohms \n",Rth)
17 I1=Vth/(Rth+20)
18 printf("\n Iload=%0.2 f A \n",I1)

```

Scilab code Exa 2.50 Find the current through the 3 ohm resistor

```

1 //Chapter 2.Ex2.50 ,Pg 2.63
2 clc;

```

```

3 disp("Refer to the diagram shown in the figure")
4 //Simultaneous equations have been found by applying
   Kirchoff's Laws to the meshes
5 A=[1 0;-12 18]
6 B=[6;42]
7 I=A\B
8 Vth=6*I(2)
9 printf("\n Vth=%0.0 f V \n ",Vth)
10 Rth=6*12/(6+12) //Thevenin resistance of the network
11 I1=Vth/(Rth+3)
12 printf("\n Iload= %0.2 f A \n",I1)

```

Scilab code Exa 2.51 Find the current through the 30 ohm resistor

```

1 //Chapter2 ,Ex2.51 ,Pg2.64
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[-1 1;15 100]
5 B=[13;150]
6 I=A\B
7 printf("\n I1=%0.0 f A \n",I(1))
8 printf("\n I2=%0.0 f A \n",I(2))
9 Vth=(40*I(2))-50
10 printf("\n Vth=%0.0 f V \n",Vth)
11 Rth=75*40/(75+40)
12 printf("\n Rth=%0.2 f ohms \n",Rth)
13 I1=Vth/(Rth+30)
14 printf("\n Iload=%0.2 f A \n",I1)

```

Scilab code Exa 2.53 Find the current through the 20 ohm resistor

```

1 //Chapter 2,Ex2.53 ,Pg2.66
2 clc;

```

```

3 disp("Refer to the diagram shown in the figure")
4 //Applying Kirchoff's laws to mesh 1 and mesh 2 we
   can state the following
5 I1=10/(10+4) //Current in amperes
6 I2=2 //Current in amperes
7 printf("\n I1=%0.2 f A \n",I1)
8 printf("\n I2=%0.0 f \n",I2)
9 vth=(4*I1)+(8*I2)
10 printf("Vth=%0.2 f V \n",vth)
11 //Calculation of Rth
12 //From the figure it can be seen that Rth can be
   easily calculated to be the following
13 Rth=(10*4/(10+4))+8
14 printf("\n Rth=%0.2 f ohms \n",Rth)
15 //Calculation of load current
16 I1=vth/(Rth+20)
17 printf("\n Iload=%0.2 f A \n",I1)

```

Scilab code Exa 2.54 Find the current through the 5 ohm resistor

```

1 //Chapter 2,Ex2.54,Pg2.67
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 //Remove the 5 ohms resistor from the network and
   apply Kirchoff's laws
5 A=[14 -2;-2 5]
6 B=[150;50]
7 I=A\B
8 printf("\n I1=%0.2 f A \n",I(1))
9 printf("\n I2=%0.2 f A \n",I(2))
10 //Calculation of Thevenin Voltage
11 Vth=100-(10*I(1))
12 printf("\n Vth=%0.2 f V \n",Vth)
13 //Calculation of Thevenin Current
14 Rth=10*3.2/(10+3.2)

```

```

15 printf("\n Rth=%0.2 f ohms \n",Rth)
16 //Calculation of load current
17 I1=Vth/(Rth+5)
18 printf("\n Iload =%0.2 f A \n",I1)

```

Scilab code Exa 2.55 Find the current through the 10 ohm resistor

```

1 //Chapter 2,Ex2.55 ,Pg2.68
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 //Calculation of Vth
5 //The network is divided into meshes and Kirchoff's
   laws are applied to the meshes to obtain
   simultaneous equations
6 A=[4 -2;-1 4]
7 B=[-25;10]
8 I=A\B
9 printf("\n I1=%0.0 f A \n",I(1))
10 printf("\n I2=%0.0 f A \n",I(2))
11 Vth=(2*I(1))+(2*I(2))
12 printf("\n Vth=%0.0 f V \n",Vth)
13 //Calculation of Rth
14 //Convert star resistances formed by 2 ohms, 2 ohms
   and 1 ohm into an equivalent delta network
15 R1=2*2/(2+2+1)
16 R2=R1 //R1=R2 since the resistances are of equal
   value
17 R3=2*1/(2+1+2)
18 Rth=8*(2*(4*1/(4+1)))/(8+(2*(4*1/(4+1))))
19 printf("\n Rth=%0.2 f ohms \n",Rth)
20 //Calculation of load current
21 I1=Vth/(Rth+10)
22 printf("\n I1=%0.2 f A \n",I1)

```

Scilab code Exa 2.56 Find current through the 1 ohm resistor

```
1 //Chapter 2,Ex2.56 ,Pg2.71
2 clc;
3 disp("Refer to the diagram shown in the question")
4 //Remove the 1 ohm resistor from the meshes 1 and 2,
   then we can say the following about the current
5 I1=-3 //Current in amperes
6 I2=1 //Current in amperes
7 printf("\n I1=%0.0 f A \n",I1)
8 printf("\n I2=%0.0 f A \n",I2)
9 //Calculation of Vth
10 Vth=4-2*(I1-I2)
11 printf("\n Vth=%0.2 f V \n",Vth)
12 //Calculation of Rth
13 //It can be easily deduced by looking at the diagram
   that Rth=2 ohms
14 Rth=2
15 //Calculation of load current
16 I1=Vth/(Rth+1)
17 printf("\n I1=%0.0 f A \n",I1)
```

Scilab code Exa 2.57 Find current in the 10 ohm resistor

```
1 //Chapter2 ,Ex2.57 ,Pg2.73
2 clc;
3 disp("Refer to the diagram shown in the question")
4 A=[1 0 0;0 -1 1;0 -5 -15]
5 B=[2;4;0]
6 I=A\B
7 printf("\n I1=%0.0 f A \n",I(1))
8 printf("\n I2=%0.0 f A \n",I(2))
```

```

9 printf("\n I3=%0.0 f A \n",I(3))
10 printf("\n In=%0.0 f A \n", (I(1)-I(2)))
11 // Calculation of Rn
12 //Replace the voltage sources by open circuit and
    current sources by short circuit
13 Rn=1*(5+15)/(1+5+15)
14 printf("\n Rn=%0.2 f ohms \n",Rn)
15 I1=(5*Rn)/(10+Rn) //Using current division formula
16 printf("\n I1 = %0.2 f A \n",I1)

```

Scilab code Exa 2.58 Find current in the 10 ohm resistor

```

1 //Chapter 2,Ex2.58 ,Pg 2.74
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[7 -2;-2 10]
5 B=[20; -12]
6 I=A\B
7 printf("\n I2= %0.2 f A \n",I(2))
8 printf("\n In=%0.2 f A \n", -I(2))
9 // Calculation of Rn
10 Rn=(5*2/(5+2))+8
11 printf("\n Rn=%0.2 f ohms \n",Rn)
12 // Calculation of I1
13 I1=0.67*(Rn/(Rn+10)) //Current is short circuit
    current calculated
14 printf("\n I1=%0.2 f A \n",I1)

```

Scilab code Exa 2.59 Find the current through the 10 ohm resistor

```

1 //Chapter 2,Ex2.59 ,Pg2.75
2 clc;
3 disp("Refer to the diagram shown in the figure")

```

```

4 A=[70 -20;-20 20]
5 B=[40;0]
6 I=A\B
7 printf("\n I1=%0.0 f A \n",I(1))
8 printf("\n I2 =%0.1 f A \n",I(2))
9 printf("\n In = %0.1 f A \n",I(2))
10 //Calculation of Rn
11 Rn=(50*20/(50+20)) //Resistance of 40 ohms gets
    shorted because it is connected across a short
    circuit
12 printf("\n Rn=%0.2 f ohms \n",Rn)
13 //Calculation of I1
14 I1=(1.5*14.28/(14.28+10))
15 printf("\n I1=%0.2 f A \n",I1)

```

Scilab code Exa 2.60 Find current through 10 ohm resistor

```

1 //Chapter 2,Ex2.60 ,Pg2.76
2 clc;
3 disp("Refer to diagram shown in the question")
4 A=[-7 1 0;-1 6 -3;0 3 -3]
5 B=[-10;0;20]
6 I=A\B
7 printf("\n I3=%0.2 f A \n",I(3))
8 printf("\n In= %0.2 f A \n",-I(3))
9 Rn=[(6*1/(6+1)+2)]*3/(3+[(6*1/(6+1)+2)])
10 printf("\n Rn=%0.2 f A \n",Rn)
11 //Calculation of I1
12 I1=13.17*(1.46/(1.46+10))
13 printf("\n I1=%0.2 f A \n",I1)

```

Scilab code Exa 2.61 Find current in the 10 ohm resistor


```

1 //Chapter2 ,Ex2.61 ,Pg2.77
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[20 -20 0;-20 60 -20;0 -20 50]
5 B=[10;40;-100]
6 I=A\B
7 printf("\n I1=%0.2 f A \n",I(1))
8 printf("\n In=%0.2 f A \n",I(1))
9 //Calculation of Rn
10 Rn=[(20*30/(20+30))+20]*20/(20+[(20*30/(20+30))+20])
11 printf("\n Rn=%0.1 f ohms \n",Rn)
12 //Calculation of I1
13 I1=I(1)*Rn/(Rn+10)
14 printf("\n I1=%0.2 f A \n",I1)

```

Scilab code Exa 2.62 Nortons equivalent

```

1 //Chapter 2,Ex2.62 ,Pg2.77
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[90 -60 0;-60 100 -30;0 30 -30]
5 B=[120;40;-10]
6 I=A\B
7 printf("\n I3=%0.2 f A \n",I(3))
8 printf("\n In=%0.2 f A \n",-I(3))
9 //Calculation of RN
10 Rn=[(30*60/(30+60))+10]*30/(30+[(30*60/(30+60))+10])
11 printf("\n Rn=%0.0 f ohms \n",Rn)

```

Scilab code Exa 2.63 Find current through the 8 ohm resistor

```

1 //Chapter 2,Ex2.63 ,Pg2.79
2 clc;

```

```

3 disp(" Refer to the diagram shown in the figure")
4 A=[-1 1;12 0]
5 B=[2;55]
6 I=A\B
7 printf("\n I1=%0.2 f A \n",I(1))
8 printf("\n I2=%0.2 f A \n",I(2))
9 printf("\n In=%0.2 f A \n",I(2))
10 //Calculation of Rn
11 Rn=12*4/(12+4)
12 printf("\n Rn=%0.0 f ohms \n",Rn)
13 //Calculation of I1
14 I1=6.58*Rn/(Rn+8)
15 printf("\n I1=%0.2 f A \n",I1)

```

Scilab code Exa 2.64 Find current through the 1 ohm resistor

```

1 //Chapter 2,Ex2.64,Pg2.80
2 clc;
3 disp(" Refer to the diagram shown in the figure")
4 A=[0 -5 -2;0 4 -2;-2 -2 4]
5 B=[-2;-1;0]
6 I=A\B
7 printf("\n I1=%0.2 f A \n",I(1))
8 printf("\n I2=%0.2 f A \n",I(2))
9 printf("\n I3=%0.2 f A \n",I(3))
10 printf("\n In=%0.2 f A \n",I(3))
11 //Calculation of Rn
12 Rn=(2*3/(2+3))+(2*2/(2+2))
13 printf("\n Rn=%0.1 f ohms \n",Rn)

```

Scilab code Exa 2.65 Find max power

```

1 //Chapter 2,Ex2.65,Pg2.82

```

```

2  clc;
3  disp(" Refer to the diagram shown in the figure")
4  I=-3/4
5  printf("\n I=%0.2 f A \n",I)
6  Vth=6+2*I-10
7  printf("\n Vth=%0.1 f V \n",Vth)
8  // Calculations Rth
9  Rth=(2*2/(2+2))+2
10 printf("\n Rth=%0.0 f ohms \n",Rth)
11 // Value of Rl
12 Pmax=(Vth*Vth/(4*Rth))
13 printf("\n Pmax=%0.2 f W \n",Pmax)

```

Scilab code Exa 2.66 Find max power

```

1  // Chapter 2, Ex2.66, Pg2.83
2  clc;
3  disp(" Refer to the diagram shown in the question")
4  // Calculation og Vth
5  A=[-1 1; -6 -5]
6  B=[4; 2]
7  I=A\B
8  printf("\n I1=%0.0 f A \n",I(1))
9  printf("\n I2=%0.0 f A \n",I(2))
10 Vth=8-I(1)
11 printf("\n Vth=%0.0 f V \n",Vth)

```

Scilab code Exa 2.67 Find max power

```

1  // Chapter 2, Ex2.67, Pg2.84
2  clc;
3  disp(" Refer to the diagram shown in the question")
4  A=[1 0; 5 -10]

```

```

5 B=[50;0]
6 I=A\B
7 printf("\n I1=%0.0 f A \n",I(1))
8 printf("\n I2=%0.0 f A \n",I(2))
9 Vth=3*I(2)
10 printf("\n Vth=%0.0 f V \n",Vth)
11 //Calculation of Rth
12 Rth=(7*3/(7+3))
13 printf("\n Rth=%0.1 f \n",Rth)
14 //For maximum power transfer the value of the load
    resistance should be equal to the value of the
    Thevenin resistance
15 Pmax=(Vth*Vth)/(4*Rth)
16 printf("\n Pmax=%0.2 f W \n",Pmax)

```

Scilab code Exa 2.68 Find R_l and calculate maximum power

```

1 //Chapter 2,Example2.68 ,Pg2.85
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[-1 1;5 2]
5 B=[6;10]
6 I=A\B
7 printf("\n I1=%0.2 f A \n",I(1))
8 printf("\n I2=%0.2 f A \n",I(2))
9 //Calculation of Vth
10 Vth=2*I(2)
11 printf("\n Vth=%0.2 f V \n",Vth)
12 //Calculation of Rth
13 Rth=(5*2/(5+2))+3+4
14 printf("\n Rth=%0.2 f ohms \n",Rth)
15 //For maximum power transfer the load resistance
    should be equal to the Thevenin resistance
16 Pmax=(Vth*Vth/(4*Rth))
17 printf("\n Pmax=%0.2 f W \n",Pmax)

```

Scilab code Exa 2.69 Find R_l and calculate max power

```
1 //Chapter 2, Example2.69,Pg2.85
2 clc;
3 disp("Refer to the diagram shown in the figure")
4 A=[15 -5;0 1]
5 B=[120;-6]
6 I=A\B
7 printf("\n I1=%0.0 f A \n",I(1))
8 printf("\n I2=%0.0 f A \n",I(2))
9 Vth=120-10*I(1) //Thevenin Voltage
10 printf("\n Vth =%0.0 f V \n",Vth)
11 //Calculation of Rth
12 Rth=(10*5/(10+5))
13 printf("\n Rth=%0.2 f ohms \n",Rth)
14 //For maximum power transfer load resistance should
    be equal to thevenin resistance
15 Pmax=(Vth*Vth/(4*Rth))
16 printf("\n Pmax=%0.2 f W \n",Pmax)
```

Scilab code Exa 2.70 Find R_l and max power

```
1 //Chapter 2,Ex2.70,Pg2.87
2 clc;
3 disp("Refer to the diagram shown in the question")
4 A=[1 0;-25 41]
5 B=[3;0]
6 I=A\B
7 printf("\n I1= %0.0 f A \n",I(1))
8 printf("\n I2= %0.0 f A \n",I(2))
9 Vth=-20+10*I(2)+6*I(2)
```

```

10 printf("\n Vth=%.2 f V \n",Vth)
11 //Calculation of Rth
12 Rth=(25*16/(25+16))
13 printf("\n Rth= %.2 f ohms \n",Rth)
14 //For maximum power transfer the load resistance
    should be equal to the Thevenin resistance
15 Pmax=(Vth*Vth/(4*Rth))
16 printf("\n Pmax=%.2 f W \n",Pmax)

```

Scilab code Exa 2.71 Max power

```

1 //Chapter 2,Ex2.71 ,Pg2.88
2 clc;
3 disp("Refer to the diagram shown in the question")
4 A=[-1 1 0;1 10 -10;0 -10 15]
5 B=[1;5;0]
6 I=A\B
7 printf("\n I1=%.2 f A \n",I(1))
8 printf("\n I2=%.2 f A \n",I(2))
9 printf("\n I3=%.2 f A \n",I(3))
10 //Calculation of Vth
11 Vth=3*I(3)
12 printf("\n Vth=%.2 f V \n",Vth)
13 //Calculation of Rth
14 Rth=[(10*1/(10+1))+2]*3/(3+[(10*1/(10+1))+2]) + 5
15 printf("\n Rth=%.2 f ohms \n",Rth)
16 //Calculation of Pmax
17 Pmax=(Vth*Vth/(4*Rth))
18 printf("\n Pmax=%.2 f W \n",Pmax)

```

Chapter 3

AC Fundamentals

Scilab code Exa 3.1 Mean value of current

```
1 //Chapter 3,Ex3.1 ,Pg3.4
2 clc;
3 Im=15/(sin(2*%pi*3.375*0.001*40))
4 printf("\n Im=%0.0 f A \n",Im)
```

Scilab code Exa 3.2 Time at which current attain a particular value

```
1 //Chapter 3,Ex3.2 ,Pg3.4
2 clc;
3 //(a)
4 //Given that f=50c/s and Im=100A
5 i=100*sin(2*%pi*50*(1/600))
6 printf("\n Instantaneous value of current i=%0.0 f A \n",i)
7 //(b)
8 t=(asin(60*%pi)/180)/(100*180)
9 printf("\n t=%0.4 f sec \n",t)
```

Scilab code Exa 3.3 Time at which current attain a particular value

```
1  clc;
2  f=50 //Frequence in hertz
3  Irms=20 //Rms current in amperes
4  Im=Irms*sqrt(2)
5  disp("( i )")
6  printf("\n Im=%02f A \n",Im)
7  t=0.0025 //Time in seconds
8  i=Im*sin(2*%pi*f*t)
9  disp("( ii )")
10 printf("\n i=%0.0 f \n",i)
11 t=0.0125
12 i=Im*sin(2*%pi*f*t)
13 disp("( iii )")
14 printf("\n i=%0.0 f \n",i)
15 i1=14.14/Im
16 disp(i1)
17 i2=asin(i1)
18 i2=i2*180/%pi
19 disp(i2)
20 i=i2/(2*180*f)
21 printf("\n i=%0.2 f \n ms",i*10^3)
```

Scilab code Exa 3.4 Time at which current attain a particular value

```
1  clc;
2  f=60
3  Im=110
4  disp("( i )")
5  t1=90/Im
6  t2=asin(t1)
```



```

7 disp(t2)
8 t2=t1*180/%pi
9 disp(t2)
10 t=t1/21600
11 printf("\n t=%0.2 f ms \n",t*10^3)

```

Scilab code Exa 3.5 Time at which current attain a particular value

```

1 //Example 5, Chapter 3
2 clc;
3 f=50 //Frequency in hertz
4 Im=9.2 //Current in amperes
5 //(i)
6 t=0.002
7 i=Im*sin(2*%pi*f*t)
8 printf("\n Instantaneous value of current=%0.2 f A \n"
, i)
9 //(ii)
10 t=0.0045
11 t=(1/(4*f))+0.0045
12 i=Im*sin(2*%pi*f*t)
13 printf("\n Instantaneous Value=%0.2 f A \n", i)

```

Scilab code Exa 3.6 Time at which current attain a particular value

```

1 //Example6, Chapter 3
2 clc;
3 f=50
4 Irms=20
5 //(i)
6 Im=Irms*sqrt(2)
7 i=10*sqrt(2)
8 ans=asin(i/Im)

```

```

9 ans=ans*180/%pi
10 t= ans/(2*180*f)
11 printf("\n t=%0.0 f ms \n",t*10^3)
12 //(ii)
13 t=(1/(4*f))+t
14 printf("\n t=%0.2 f ms \n",t)

```

Scilab code Exa 3.8 Time at which current attain a particular value

```

1 //Example 8, Chapter 3
2 clc;
3 f=50
4 Irms=10 //Current in amperes
5 //(i)
6 Im=Irms*sqrt(2)
7 disp('14.14 sin(18000t)')
8 //(ii)
9 t=0.0025
10 t=(1/(4*f)) + t
11 printf("\n t=%0.1 f ms \n",t*10^3)
12 i=14.14*sin(18000*7.5*10^-3)
13 printf("\n i=%0.0 f A \n",i)
14 //(ii)
15 t=0.0075
16 t=(1/(2*f))+t
17 printf("\n t=%0.1 f ms \n",t*10^3)
18 i=14.14*sin(18000*t*10^-3)
19 printf("\n i=%0.0 f A \n",i)

```

Scilab code Exa 3.10 Time at which current attain a particular value

```

1 //Example 10, Chapter 3
2 //(i)

```

```

3  clc;
4  Ieff=7.071/sqrt(2)
5  Irms=Ieff
6  Im=5*sqrt(2)
7  //(ii)
8  f=(157.08)/(2*%pi)
9  T=(1/f)
10 printf(" \n T=%0.2 f s \n",T)
11 //(iii)
12 t=(asin((7.071/7.071))+0.785)/157.08
13 printf(" \n t=%0.3 f s \n",t)

```

Scilab code Exa 3.15 Form factor Frequency and Crest Factor

```

1  //Example 15, Chapter 3
2  clc;
3  f=(314/(2*%pi))
4  printf(" \n f=%0.0 f Hz \n",f)
5  disp(' For a sinusoidal waveform ')
6  disp(' Vavg=2Vm/pi ')
7  disp(' Vrms=Vm/sqrt(2) ')
8  //(ii)
9  disp(' kf=Vrms/Vavg ')
10 kf=%pi/(2*sqrt(2))
11 printf(" \n kf=%0.2 f \n",kf)
12 //(iii)
13 disp(' kp=Vm/Vrms ')
14 kp=sqrt(2)
15 printf(" \n kp=%0.3 f \n",kp)

```

Scilab code Exa 3.16 RMS value and maximum value

```

1  //Example 16, Chapter 3

```

```

2 kf=1.2 //Form factor
3 kp=1.5 //Peak factor
4 Vavg=10
5 //(i)
6 Vrms=kf*Vavg
7 printf("\n Vrms=%0.0 f V \n",Vrms)
8 //(ii)
9 Vm=kp*Vrms
10 printf("\n Vm=%0.0 f V \n",Vm)

```

Scilab code Exa 3.17 Average value and RMS value of voltage

```

1 //Example 17, Chapter 3
2 kf=1.15
3 kp=1.5
4 Vm=4500
5 //(i)
6 Vrms=Vm/kp
7 printf("\n Vrms=%0.0 f V \n",Vrms)
8 //(ii)
9 Vavg=Vrms/kf
10 printf("\n Vavg=%0.1 f V \n",Vavg)

```

Chapter 4

Three Phase Circuits

Scilab code Exa 4.1 Calculation of Z

```
1 //Chapter 4,Ex4.1,Pg 4.8
2 funcprot(0)
3 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar
   coordinates
4     polar=ones(1,2)
5     polar(1)=sqrt((x^2)+(y^2))
6     polar(2)=atan(y/x)
7     polar(2)=(polar(2)*180)/%pi
8 endfunction
9 function [rect] = polar2rect(r,theta) //Function to
   convert polar coordinates to rectangular
   coordinates
10    rect=ones(1,2)
11    theta=(theta*%pi)/180
12    rect(1)=r*cos(theta)
13    rect(2)=r*sin(theta)
14 endfunction
15 clc;
16 //Refer to the data given in the question
17 V1=440 //Supply voltage
```

```

18 f=50 //Freq in hertz
19 Vph=Vl/sqrt(3) //Phase voltage
20 printf("\n Vph=%0.2 f V \n",Vph)
21 Zbarph=rect2polar(8,10) //Converting Zbarph from
    rectangular coordinates to polar coordinates
22 printf("\n r=%0.2 f \n",Zbarph(1))
23 printf("\n theta=%0.2 f \n",Zbarph(2))
24 Iph=Vph/Zbarph(1) //Phase current
25 printf("\n Iph=%0.2 f A \n",Iph)
26 Il=Iph //Line current
27 P=sqrt(3)*Il*Vl*cos(Zbarph(2)*%pi/180)
28 P=P*(10^-3) //Active power
29 Q=sqrt(3)*Vl*Il*sin(Zbarph(2)*%pi/180)
30 Q=Q*(10^-3) //Reactive power
31 printf("\n P=%0.2 f kW \n",P)
32 printf("\n Q=%0.2 f kVAR \n",Q)

```

Scilab code Exa 4.2 Calculation of Z

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y)
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 function [rect] = polar2rect(r,theta)
9     rect=ones(1,2)
10    theta=(theta*%pi)/180
11    rect(1)=r*cos(theta)
12    rect(2)=r*sin(theta)
13 endfunction
14 //Refer to the data given in the question
15 clc;
16 Vl=230 //Line voltage in volts

```

```

17 f=50 //freq in hertz
18 Vph=Vl
19 Zbarph=rect2polar(8,-6)
20 r=Zbarph(1)
21 printf("\n r=%0.0 f \n",r)
22 phi=Zbarph(2)
23 printf("\n phi=%0.2 f degrees \n",Zbarph(2))
24 pf=cos(phi*%pi/180)
25 printf("\n Power factor=%0.1 f (leading) \n",pf)
26 Iph=Vph/Zbarph(1)
27 printf("\n Iph=%0.0 f A \n",Iph)
28 Il=sqrt(3)*Iph
29 printf("\n Il=%0.2 f A \n",Il)
30 Q=sqrt(3)*Vl*Il*sin(phi*%pi/180)
31 Q=Q*(10^-3)
32 printf("\n Reactive power Q=%0.2 f kVAR \n",Q)

```

Scilab code Exa 4.3 Calculation of active power reactive power and total power

```

1 //Chapter4 , Ex4.3 , Pg4.9
2 funcprot(0)
3 function [polar] = rect2polar(x,y)
4     polar=ones(1,2)
5     polar(1)=sqrt((x^2)+(y^2))
6     polar(2)=atan(y/x)
7     polar(2)=(polar(2)*180)/%pi
8 endfunction
9 function [rect] = polar2rect(r,theta)
10    rect=ones(1,2)
11    theta=(theta*%pi)/180
12    rect(1)=r*cos(theta)
13    rect(2)=r*sin(theta)
14 endfunction
15 //Refer to the data given in the question

```

```

16 clc;
17 R=8 //Resistance in ohms
18 L=0.02 //Inductance in Henry
19 V1=230 //Line voltage in volts
20 f=50
21 Vph=V1/sqrt(3) //Phase voltage
22 printf("\\n Vph=%0.2 f V \\n",Vph)
23 Xl=2*%pi*f*L
24 Zbarph=rect2polar(R,Xl) //Converting rectangular
    coordinates to polar coordinates
25 r=Zbarph(1)
26 phi=Zbarph(2)
27 printf("\\n Zph=%0.2 f ohms \\n",r)
28 printf("\\n phi=%0.2 f degrees \\n",phi)
29 phi=phi*%pi/180 //Converting degrees to radians
30 printf("\\n Power factor =%0.2 f (lagging) \\n",cos(phi)
    )
31 Iph=Vph/r
32 printf("\\n Iph=%0.2 f A \\n",Iph)
33 I1=Iph
34 P=sqrt(3)*V1*I1*cos(phi)
35 P=P*(10-3)
36 printf("\\n Active power =%0.2 f kW \\n",P)
37 Q=sqrt(3)*V1*I1*sin(phi)
38 Q=Q*(10-3)
39 printf("\\n Reactive power Q=%0.2 f kVAR \\n",Q)
40 S=sqrt(3)*V1*I1
41 S=S*(10-3)
42 printf("\\n Total power =%0.3 f kVA \\n",S)

```

Scilab code Exa 4.4 Calculation of P

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
    convert rectangular coordinates to polar

```



```

    coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 function [rect] = polar2rect(r,theta) //Function to
    convert polar coordinates to rectangular
    coordinates
9     rect=ones(1,2)
10    theta=(theta*%pi)/180
11    rect(1)=r*cos(theta)
12    rect(2)=r*sin(theta)
13 endfunction
14 clc
15 R=8 //Resistance in ohms
16 L=0.02 //Inductance in henry
17 V1=400 //Line voltage
18 f=50 //Freq in hertz
19 Xl=2*%pi*f*L
20 Zbarph=rect2polar(R,Xl)
21 r=Zbarph(1)
22 phi=Zbarph(2)
23 printf("\n Zph=%0.2 f ohms \n",r)
24 printf("\n phi=%0.2 f degrees \n",phi)
25 phi=phi*%pi/180 //Converting degrees to radians
26 Iph=V1/r
27 printf("\n Iph=%0.2 f A \n",Iph)
28 I1=sqrt(3)*Iph
29 printf("\n I1=%0.2 f A \n",I1)
30 P=sqrt(3)*V1*I1*cos(phi) //Active power
31 printf("\n P=%0.2 f kW \n",P*(10^-3))

```

Scilab code Exa 4.5 Calculation of different powers for line and phase voltages

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar
   coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 function [rect] = polar2rect(r,theta) //Function to
   convert polar coordinates to rectangular
   coordinates
9     rect=ones(1,2)
10    theta=(theta*%pi)/180
11    rect(1)=r*cos(theta)
12    rect(2)=r*sin(theta)
13 endfunction
14 clc;
15 //Refer to the data given in the question
16 R=9 //resistance in ohms
17 Xl=12 //Reactance in ohms
18 f= 50 // Frequence of supply in hertz
19 V1=440 //Supply voltage in V
20 Vph=V1 //For delta connected load
21 Zbarph=rect2polar(9,12)
22 r=Zbarph(1)
23 phi=Zbarph(2)
24 printf("\n Zph=%0.2 f ohms \n",r)
25 printf("\n phi=%0.2 f degrees \n",phi)
26 phi=phi*%pi/180 //Converting degrees to radians
27 Iph=Vph/r
28 printf("\n Iph=%0.2 f A \n",Iph)
29 I1=sqrt(3)*Iph
30 printf("\n I1=%0.1 f A \n",I1)
31 printf("\n Power factor =%0.1 f (lagging) \n",cos(phi)
   )
32 S=sqrt(3)*V1*I1 //Total power
33 printf("\n S=%0.2 f kVA \n",S*(10^-3))

```

```

34 P=sqrt(3)*Vl*I1*cos(phi)
35 printf("\n P=%0.2 f kW \n",P*(10^-3))
36 Q=sqrt(3)*Vl*I1*sin(phi)
37 printf("\n Q=%0.2 f kVAR \n",Q*(10^-3))
38 //If the coils were in star connection
39 Vph=Vl/sqrt(3)
40 printf("\n Vph=%0.2 f V \n",Vph)
41 Iph=Vph/r
42 I1=Iph
43 printf("\n Iph=%0.2 f A \n",Iph)
44 pf=cos(phi)
45 printf("\n Power factor=%0.1 f (lagging) \n",pf)
46 S=sqrt(3)*Vl*I1
47 printf("\n total power=%0.2 f kVA \n",S*(10^-3))
48 P=sqrt(3)*Iph*pf
49 printf("\n P=%0.2 f kVA \n",P*(10^-3))
50 Q=sqrt(3)*Vl*Iph*(sqrt(1-pf^2))
51 printf("\n Q=%0.2 f kVAR \n",Q*(10^-3))

```

Scilab code Exa 4.6 Calculation of different powers for line and phase voltages

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar
   coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 function [rect] = polar2rect(r,theta) //Function to
   convert polar coordinates to rectangular
   coordinates
9     rect=ones(1,2)

```

```

10     theta=(theta*%pi)/180
11     rect(1)=r*cos(theta)
12     rect(2)=r*sin(theta)
13 endfunction
14 clc
15 //Refer to the data given in the question
16 V1=415
17 R=15
18 L=0.1
19 f=50
20 C=177*(10^-6)
21 Vph=V1/sqrt(3)
22 Xl=2*%pi*f*L
23 Xc=1/(2*%pi*f*C)
24 Zbarph=rect2polar(R,(Xl-Xc))
25 r=Zbarph(1)
26 printf("\n Zph=%0.2 f ohms \n",Zbarph(1))
27 phi=Zbarph(2)
28 printf("\n phi=%0.2 f degrees \n",Zbarph(2))
29 phi=phi*%pi/180
30 pf=cos(phi)
31 printf("\n Power factor=%0.3 f (lagging) \n",pf)
32 Iph=Vph/r
33 printf("\n Iph=%0.1 f A \n",Iph)
34 P=sqrt(3)*V1*I1*cos(phi)
35 printf("\n P=%0.2 f kW \n",P*(10^-3))
36 Q=sqrt(3)*V1*I1*sin(phi)
37 printf("\n Q=%0.2 f kVAR \n",Q*(10^-3))
38 S=sqrt(3)*V1*I1
39 printf("\n Total power =%0.2 f kVA \n",S*(10^-3))
40 //If the same impedance is connected in delta
41 Vph=V1
42 Iph=Vph/r
43 printf("\n Iph=%0.2 f A \n",Iph)
44 I1=sqrt(3)*Iph
45 printf("\n I1=%0.2 f A \n",I1)
46 P=sqrt(3)*V1*I1*cos(phi)
47 printf("\n P=%0.2 f kW \n",P*(10^-3))

```

Scilab code Exa 4.7 Calculation of different powers for line and phase voltages

```
1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar
   coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 function [rect] = polar2rect(r,theta) //Function to
   convert polar coordinates to rectangular
   coordinates
9     rect=ones(1,2)
10    theta=(theta*%pi)/180
11    rect(1)=r*cos(theta)
12    rect(2)=r*sin(theta)
13 endfunction
14 clc
15 //Refer to the data given in the question
16 L=50*(10^-3) //load inductance in mH
17 R=50 //Resistance in ohms
18 C=50*(10^-6) //Capacitance in microfarads
19 V1=550 //Line voltage in volts
20 w=800 //Angular frequency
21 Vph=V1 //For delta connected load,phase voltage=line
   voltage
22 Xl=w*L
23 Xc=1/(w*C)
24 printf("\n Xl=%0.0 f ohms \n",Xl)
25 printf("\n Xc=%0.0 f ohms \n",Xc)
26 Zbarph=rect2polar(10,20)
```

```

27 r=Zbarph(1)
28 printf("\n Zph=%.2 f \n",r)
29 printf("\n phi=%.2 f \n",Zbarph(2))
30 Iph=Vph/r
31 printf("\n Iph=%.2 f A \n",Iph)
32 pf=cos(Zbarph(2)*%pi/180)
33 printf("\n Power factor=%.3 f (lagging) \n",pf)
34 Il=sqrt(3)*Iph
35 P=sqrt(3)*Vl*Il*pf
36 printf("\n P=%.2 f kW \n",P*(10^-3))
37 Q=sqrt(3)*Vl*Il*sin(Zbarph(2)*%pi/180)
38 printf("\n Q=%.1 f kVAR \n",Q*(10^-3))
39 S=sqrt(3)*Vl*Il
40 printf("\n S=%.2 f kVA \n",S*(10^-3))

```

Scilab code Exa 4.8 Calculation of P

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar
   coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 function [rect] = polar2rect(r,theta) //Function to
   convert polar coordinates to rectangular
   coordinates
9     rect=ones(1,2)
10    theta=(theta*%pi)/180
11    rect(1)=r*cos(theta)
12    rect(2)=r*sin(theta)
13 endfunction
14 clc

```

```

15 //Refer to the data given in the question
16 V1=440 //Line voltage
17 P=50*(10^3) //Active power in watts
18 I1=90 //Load current in amperes
19 Vph=V1 //For delta connected load phase voltage=line
    voltage
20 Iph=I1/sqrt(3)
21 printf("\n Iph=%.2 f A \n",Iph)
22 //Since P, I1 and V1 have been given , the power
    factor can be calculated easily
23 pf=P/(sqrt(3)*V1*I1)
24 printf("\n Power factor=%.2 f (lagging) \n",pf)
25 S=sqrt(3)*V1*I1
26 printf("\n S=%.2 f kVA \n",S*(10^-3))

```

Scilab code Exa 4.9 Calculation of active power reactive power and total power

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
    convert rectangular coordinates to polar
    coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 function [rect] = polar2rect(r,theta) //Function to
    convert polar coordinates to rectangular
    coordinates
9     rect=ones(1,2)
10    theta=(theta*%pi)/180
11    rect(1)=r*cos(theta)
12    rect(2)=r*sin(theta)
13 endfunction

```

```

14 clc
15 //Refer to the data given in the question
16 I1=15 //Current in amperes
17 P=11*(10^3) //Active power in kilowatts
18 S=15*(10^3)
19 V1=S/(sqrt(3)*I1)
20 printf("\\n V1=%0.2 f V \\n",V1)
21 Vph=V1/sqrt(3)
22 printf("\\n Vph=%0.2 f V \\n",Vph)
23 pf=P/S //Power factor
24 printf("\\n Power factor=%0.3 f \\n",pf)
25 phi=acos(pf)
26 phi=phi*180/%pi
27 printf("\\n phi=%0.2 f degrees \\n",phi)
28 Q=sqrt(3)*V1*I1*sin(phi*%pi/180)
29 printf("\\n Q=%0.1 f kVAR \\n",Q*10^-3)
30 //For star connected load ,I1=Iph
31 Zph=Vph/I1
32 printf("\\n Zph=%0.2 f ohms \\n",Zph)
33 R=Zph*pf
34 printf("\\n R=%0.2 f ohms \\n",R)
35 Xl=Zph*sqrt(1-(pf^2))
36 printf("\\n Xl=%0.2 f ohms \\n",Xl)
37 Vph=V1 //If the coils are connected in delta
38 Iph=Vph/Zph
39 I1=sqrt(3)*Iph
40 printf("\\n I1=%0.0 f A \\n",I1)
41 P=sqrt(3)*V1*I1*pf
42 printf("\\n P=%0.2 f kW \\n",P*(10^-3))
43 Q=sqrt(3)*V1*I1*sqrt(1-(pf^2))
44 printf("\\n Q=%0.2 f kVAR \\n",Q*(10^-3))

```

Scilab code Exa 4.11 Calculation of phase resistance and phase impedance

```

1 funcprot(0)

```



```

2 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar
   coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 clc
9 //Refer to the data given in the question
10 V1=208 //Line voltage
11 P=1800 //Active power
12 I1=10 //Line current
13 Vph=V1/sqrt(3)
14 printf("\n Vph=%.2 f V \n",Vph)
15 Iph=I1
16 Zph=Vph/Iph
17 printf("\n Zph=%.2 f ohms \n",Zph)
18 //Since the active power,line voltage and line
   current are given , the power factor can be
   calculated easily
19 pf=P/(sqrt(3)*V1*I1)
20 printf("\n Power factor=%.2 f \n",pf)
21 phi=acos(pf)
22 phi=phi*180/%pi
23 printf("\n phi=%.0 f degrees \n",phi)
24 Rph=Zph*pf
25 printf("\n Rph=%.2 f ohms \n",Rph)
26 Xph=Zph*sqrt(1-pf^2)
27 printf("\n Xph=%.2 f ohms \n",Xph)

```

Scilab code Exa 4.13 Calculation of phase resistance and phase reactance

```

1 //Chapter 4,Ex4.1 ,Pg 4.8
2 funcprot(0)

```

```

3 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar
   coordinates
4     polar=ones(1,2)
5     polar(1)=sqrt((x^2)+(y^2))
6     polar(2)=atan(y/x)
7     polar(2)=(polar(2)*180)/%pi
8 endfunction
9 clc;
10 //Refer to the data given in the question
11 V1=400 //Supply voltage
12 I1=34.65 //Current in Amperes
13 P=14.4*10^3 //Active power in volts
14 Vph=V1
15 Iph=I1/sqrt(3)
16 printf("\n Iph=%0.0 f A \n",Iph)
17 Zph=Vph/Iph
18 printf("\n Zph=%0.0 f ohms \n",Zph)
19 //We can calculate the power factor easily from the
   given data
20 pf=P/(sqrt(3)*400*34.65)
21 printf("\n Power factor=%0.1 f \n",pf)
22 phi=acos(pf)
23 phi=phi*180/%pi
24 printf("\n phi=%0.2 f degrees \n",phi)
25 Rph=Zph*pf
26 printf("\n Rph=%0.0 f ohms \n",Rph)
27 Xph=Zph*sqrt(1-pf^2)
28 printf("\n Xph=%0.0 f ohms \n",Xph)

```

Scilab code Exa 4.14 Calculation of Q

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
   convert rectangular coordinates to polar

```

```

        coordinates
3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 clc
9 //Refer to the data given in the question
10 P=10.44*10^3 //Power in kWh
11 V1=200 //Line voltage
12 pf=0.5 //Leading power factor
13 Vph=V1 //For delta connected load
14 //Since we have the value of active power,line
    voltage and power factor we can easily calculate
    the value of line current
15 I1=P/(sqrt(3)*V1*pf)
16 printf("\n I1=%0.2 f A \n",I1)
17 Iph=I1/sqrt(3)
18 printf("\n Iph=%0.1 f A \n",Iph)
19 Zph=Vph/Iph
20 printf("\n Zph=%0.2 f ohms \n",Zph)
21 Rph=Zph*pf
22 printf("\n Rph=%0.3 f ohms \n",Rph)
23 Xph=Zph*(sqrt(1-pf^2))
24 printf("\n Xph=%0.2 f ohms \n",Xph)
25 Q=sqrt(3)*V1*I1*sqrt(1-pf^2)
26 printf("\n Q=%0.2 f kVAR \n",Q*10^-3)

```

Scilab code Exa 4.17 Calculation of active and reactive components of phase current

```

1 funcprot(0)
2 function [polar] = rect2polar(x,y) //Function to
    convert rectangular coordinates to polar
    coordinates

```

```

3     polar=ones(1,2)
4     polar(1)=sqrt((x^2)+(y^2))
5     polar(2)=atan(y/x)
6     polar(2)=(polar(2)*180)/%pi
7 endfunction
8 clc
9 Po=200*10^3 //Output Power
10 f=50 //frequency in hertz
11 V1=440
12 n=91 //efficiency
13 pf=0.86
14 Vph=V1 //For a delta connected load
15 //Since the efficiency and output power have been
    given in the question , the input power can be
    easily calculated
16 Pi=(Po/n)*100
17 printf("\n Input power=%0.2 f kW \n",Pi*10^-3)
18 //Since the input power is now known we can
    calculate the line current
19 I1=Pi/(sqrt(3)*V1*pf)
20 printf("\n I1=%0.1 f A \n",I1)
21 Iph=I1/sqrt(3)
22 printf("\n Iph=%0.1 f A \n",Iph)
23 apc=Iph*pf //Active component of phase current
24 printf("\n Active component of phase current=%0.1 f A
    \n",apc)
25 rpc=Iph*sqrt(1-pf^2)
26 printf("\n Reactive component of phase current=%0.1 f
    A \n",rpc)

```

Scilab code Exa 4.20 Calculation of P

```

1 clc
2 V1=400 //Three phase supply voltage
3 Zph=100 //Impedance in ohms

```

```

4 Vph=Vl/sqrt(3) //For a star connected load
5 printf("\n Vph=%0.2 f V \n",Vph)
6 Iph=Vph/Zph
7 printf("\n Iph=%0.2 f A \n",Iph)
8 I1=Iph
9 pf=1
10 P=sqrt(3)*Vl*I1*pf
11 printf("\n P=%0.1 f W \n",P)
12 Vph=Vl //For a delta connected load
13 Iph=Vph/Zph
14 printf("\n Iph=%0.0 f A \n",Iph)
15 I1=sqrt(3)*Iph
16 printf("\n I1=%0.2 f A \n",I1)
17 P=sqrt(3)*Vl*I1*pf
18 printf("\n P=%0.2 f W \n",P)

```

Chapter 5

Single phase Transformer

Scilab code Exa 5.1 Example number 1

```
1 //Chapter5 , Ex5.1 , Pg5.4
2 clc;
3 //(i)
4 V2=110*110/220 // V2/V1 = E2/E1
5 printf("\n V2=%0.0 f V \n",V2)
6 //(ii)
7 printf("\n V2=%0.0 f V \n",0)
```

Scilab code Exa 5.2 Example number 2

```
1 //Chapter5 , Ex5.2 , Pg5.5
2 clc;
3 //Given data: Flux required=4.13mWb, V1=110V f=50,
4 N1=110/(4.44*50*0.001*4.13) //No. of turns= Voltage
    of operation/(Flux required*4.44*frequency of
    input signal)
5 printf("\n No. of turns=%0.0 f turns \n",N1)
```

Scilab code Exa 5.3 Example number 3

```
1 //Chapter 5,Ex5.3 ,Pg5.5
2 clc;
3 //Given f=50Hz V1=240V N1=80 N2=280 A=200sq cm
4 //V1 is approximately equal to E1 for a transformer
5 //(i)
6 B=240/(4.44*50*200*0.0001*80) //E1=4.44fBmAN1
7 printf("\n Maximum flux density Bm=%0.2 f Wb/m2 \n",B)
8 //(ii)
9 E2=(280/80)*240 //Induced Emf E2=N2/N1*E1
10 printf("\n Induced EMF E2=%0.0 f V \n",E2)
```

Scilab code Exa 5.4 Example number 4

```
1 //Chapter 5,Ex5.4 ,Pg5.5
2 clc;
3 //Given E1=3200V E2=400V f=50Hz N2=111
4 //Part(i)
5 N1=(3200/400)*111 //E2/E1=N2/N1
6 printf("\n No of turns in primary=%0.0 f turns \n",N1)
7 //Part(ii)
8 I2=80*1000/400 //I2=KVA Rating*1000/V2 where I2=
   secondary current
9 printf("\n Secondary current I2=%0.0 f A \n",I2)
10 //Part(iii)
11 A=400/(4.44*50*1.2*111) //Using the formula E=4.44
   BmAfN2
12 printf("\n Cross sectional area=%0.4 f sq m \n",A)
```

Scilab code Exa 5.5 Example number 5

```
1 //Chapter5 , Ex5.5 , Pg5.6
2 clc;
3 //Given: kVA rating=5kVA E1=240V E2=2400V f=50Hz Bm
   =1.2 Tesla
4 N1=240/8 //Since it is given that EMF per turn is 8
5 //(i)
6 printf("\n No. of turns in primary=%0.0f \n",N1)
7 //(ii)
8 N2=(2400/240)*N1 //E2/E1=N2/N1
9 A=2400/(4.44*50*1.2*300) //using the formula E=4.44
   BmAfN2
10 printf("\n Cross sectional area=%0.2f sq m \n",A)
11 //(iii)
12 I1=5*1000/240 //Using the formula I=kVA rating*1000/
   V1
13 printf("\n I1=%0.2f A \n",I1)
14 I2=5*1000/2400
15 printf("\n I2=%0.2f A \n",I2)
```

Scilab code Exa 5.6 Example 6

```
1 //Chapter5 , Ex5.6 , Pg5.6
2 clc;
3 //Given: kVA rating=250kVA f=50Hz N2/N1=0.1 E2=240V
4 //(i)
5 E1=240/0.1 //E2/E1=N2/N1
6 printf("\n Primary EMF E1=%0.0f V \n",E1)
7 //(ii)
8 I1=250*1000/2400 //Using the formula I=kVA rating
   *1000/V
9 printf("\n I1=%0.2f A \n",I1)
10 I2=250*1000/240
11 printf("\n I2=%0.2f A \n",I2)
```

Scilab code Exa 5.7 Example 7

```
1 //Chapter 5,Ex5.7,Pg 5.8
2 clc;
3 W0=200 //Power
4 R1=3.5 //Primary resistance
5 V1=2300 //Primary voltage
6 I0=0.3 //no load current
7 c1=(I0^2)*R1
8 printf("\n Copper loss=%0.3f W \n",c1)
9 coreloss=W0-c1 //Core loss=Input power-copper loss
10 printf("\n Core loss=%0.3f W \n",coreloss)
11 pf=W0/(V1*I0)
12 printf("\n Power factor = %0.2f (lagging) \n",pf)
```

Scilab code Exa 5.8 Example number 8

```
1 //Chapter 5,Ex5.8,Pg 5.8
2 clc;
3 //Primary voltage=230V no-load primary current=5A pf
  =0.25 N1=200 f=50Hz
4 //(i)
5 fluxm=230/(4.44*50*200) //Using E=4.44fN1*fluxm
6 printf("\n Max flux in the core=%0.5f Wb \n",fluxm)
7 //(ii)
8 W=230*5*0.25 //Using the formula W=V1*I0*powerfactor
9 printf("\n Core loss =%0.1f W \n",W)
10 //(iii)
11 x=sqrt(1-(0.25^2)) //x=sin(phi)
12 Iu=5*x
13 printf("\n Magnetising current=%0.2f A \n",Iu)
```

Scilab code Exa 5.9 Example number 9

```
1 //Chapter 5,Ex5.9 ,Pg 5.13
2 clc;
3 tr=4 //tr=N1/N2=4 which is given in the question
4 K=1/tr
5 Rp=50/(K^2) // Using the formula Equivalent
   resistance referred to primary= $R'=R/(K^2)$ 
6 printf("\\n Rp=%0.0 f ohms \\n",Rp)
```

Scilab code Exa 5.11 Example number 11

```
1 //Chapter 5,Ex5.10 ,Pg5.13
2 clc;
3 E1=6600 //Primary voltage
4 E2=400 //Secondary voltage
5 R1=2.5 //Primary resistance
6 X1=3.9 //Primary reactance
7 X2=0.025 //Secondary reactance
8 R2=0.01 //Secondary resistance
9 K=E2/E1
10 //Equivalent resistance referred to primary
11 R01=R1+(R2/K^2)
12 printf("\\n Equivalent resistance referred to primary
   =%0.2 f ohms \\n",R01)
13 //Equivalent reactance referred to primary
14 X01=X1+(X2/K^2)
15 printf("\\n Equivalent reactance referred to
   secondary =%0.2 f ohms \\n",X01)
16 //Equivalent resistance referred to secondary
17 R02=R2+((K^2)*R1)
```

```

18 printf("\n Equivalent resistance referred to
    secondary=%.2f ohms \n",R02)
19 //Equivalent resistance referred to secondary
20 X02=X2+((K^2)*X2)
21 printf("\n Equivalent resistance referred to
    secondary=%.2f ohms \n",X02)

```

Scilab code Exa 5.12 Example number 12

```

1 //Chapter 5,Ex5.12,Pg5.14
2 clc;
3 E1=4400 //Primary EMF
4 R1=3.45 //Primary resistance in ohms
5 X1=5.2 //Primary reactance in ohms
6 E2=220 //Secondary EMF
7 R2=0.009 //Secondary resistance in ohms
8 X2=0.015 //Secondary reactance in ohms
9 K=E2/E1
10 I1=50*1000/E1 //Using the formula I1=kVA rating
    *1000/E
11 printf("\n Full load Primary current I1=%.2f A \n",
    I1)
12 I2=50*1000/220
13 printf("\n Full load secondary current I2=%.2f A \n"
    ,I2)
14 R01=R1+(R2/(K*K))
15 printf("\n Equivalent resistance referred to primary
    =%.2f ohms \n",R01)
16 X01=X1+(X2/(K*K))
17 printf("\n Equivalent reactance referred to primary
    =%.1f ohms \n",X01)
18 Z01=sqrt((R01^2)+(X01*X01))
19 printf("\n Equivalent impedance referred to primary=
    %.2f ohms \n",Z01)
20 R02=(K^2)*R01

```

```

21 printf("\n Equivalent resistance referred to
    secondary=%0.2f ohms \n",R02)
22 X02=(K^2)*X01
23 printf("\n Equivalent reactance referred to
    secondary=%0.3f ohms \n",X02)
24 Z02=(K^2)*Z01
25 printf("\n Equivalent impedance referred to
    secondary=%0.2f ohms \n",Z02)
26 CL1=(I1^2)*R1 + (I2^2)*R2
27 printf("\n Copper losses with individual resistances
    =%0.2f W \n",CL1)
28 CL2=(I1^2)*R01
29 printf("\n Copper loss with equivalent resistances=%0
    .1f W \n",CL2)

```

Scilab code Exa 5.13 Example number 13

```

1 //Chapter 5,Ex5.13 ,Pg5.17
2 clc;
3 E2=440 //Secondary voltage
4 V2=400 //voltage at full load
5 //Given that power factor=0.8(lagging)
6 percentreg=((E2-V2)/E2)*100
7 printf("\n Percentage regulation=%0.2f percent\n",
    percentreg)

```

Scilab code Exa 5.15 Example number 15

```

1 //Chapter 5,Ex5.16 ,Pg5.18
2 clc;
3 //Let x=cos(phi) and y=sin(phi)
4 x=0.8
5 y=0.6

```

```

6 vr=1
7 vx=5
8 //For 0.8 lagging power factor
9 percentreg=vr*x+vx*y
10 printf("\n Percentage regulation=%0.1f percent \n",
    percentreg)
11 //For unity power factor
12 x=1
13 y=0
14 percentreg=vr*x+vx*y
15 printf("\n Percent regulation=%0.0f percent \n",
    percentreg)
16 //For 0.8 leading pf
17 x=0.8
18 y=0.6
19 percentreg=vr*x-vx*y
20 printf("\n Percent regulation=%0.1f percent \n",
    percentreg)

```

Scilab code Exa 5.17 Example number 17

```

1 //Chapter5 ,Ex5.17 ,Pg5.19
2 clc;
3 E1=230 //EMF in primary winding
4 E2=460 //EMF in secondary winding
5 R1=0.2 //Primary resistance
6 R2=0.75 //Secondary resistance
7 X1=0.5 //Reactance in ohms
8 X2=1.8 //Secondary reactance in ohms
9 I2=10 //secondary current in amperes
10 pf=0.8 //cos(phi)=0.8
11 K=E2/E1
12 printf("K=%0.0f \n",K)
13 R02=R2+(K^2)*R1 //Effective secondary resistance
14 X02=X2+(K^2)*X1 //Effective secondary reactance

```

```

15 y=sqrt(1-(pf^2)) //sin(phi)=y
16 V2=E2-I2*((R02*pf)+(X02*y))
17 printf("\n Secondary terminal voltage=%0.1f V \n",V2)

```

Scilab code Exa 5.18 Example number 18

```

1 //Example 5.18 ,Pg5.20
2 clc;
3 //Given Full load kVA=100kVA
4 //Wi=600W(iron loss)
5 //WCu=1.5kW(copper loss)
6 //(i)
7 x=1 //Full load
8 pf=0.8
9 n=(x*100*pf/((x*100*pf)+0.6+((x^2)*1.5)))*100
10 printf("\n Efficiency=%0.2f percent \n",n)
11 //(ii)
12 x=0.5
13 pf=1
14 n=(x*100*pf/((x*100*pf)+0.6+((x^2)*1.5)))*100
15 printf("\n Efficiency=%0.2f percent \n",n)

```

Scilab code Exa 5.19 Example number 19

```

1 //Ex5.19 ,Pg5.21
2 clc;
3 flkva=25 //Full load kVA
4 R1=1.8 //Primary resistance in ohms
5 R2=0.02 //Secondary resistance in ohms
6 E1=2200 //Primary EMF in volts
7 E2=220 //Secondary EMF in volts
8 Wi=1000 //Iron loss in watts
9 I2=flkva*1000/220

```

```

10 printf("\n I2=%0.2 f A \n",I2)
11 K=E2/E1
12 printf("\n K=%0.1 f \n",K)
13 R02=R2+(K^2)*R1
14 printf("\n Effective secondary resistance=%0.3 f ohms
    \n",R02)
15 Wcu=(I2^2)*R02
16 printf("\n Copper loss=%0.2 f W \n",Wcu)
17 //(i)
18 x=1 //Full load
19 pf=1
20 n=(x*flkva*pf/((x*flkva*pf)+Wi/1000+((x^2)*Wcu/1000)
    ))*100
21 printf("\n Efficiency=%0.2 f percent \n",n)
22 //(ii)
23 x=0.5
24 pf=0.8
25 n=(x*flkva*pf/((x*flkva*pf)+Wi/1000+((x^2)*Wcu/1000)
    ))*100
26 printf("\n Efficiency=%0.2 f percent \n",n)

```

Scilab code Exa 5.20 Example number 20

```

1 //Ex5.20 ,Pg5.22
2 clc;
3 n1=98.135 //Given efficiency
4 n2=97.751 //Given efficiency
5 x=1 //Full load
6 pf=0.8 //Power factor
7 //Using the above data we have to solve 2
    simultaneous equations by substituting the values
    in the formula for calculating the efficiency
8 A=[1 1;1 0.25]
9 B=[3.8; 2.3]
10 W=A\B

```

```

11 printf("\n Full load copper loss =%.0f kW \n",W(2))
12 printf("\n Iron loss =%.1f kW \n",W(1))

```

Scilab code Exa 5.21 Example number 21

```

1 //Ex5.21 ,Pg5.23
2 clc;
3 //Given x=1 and pf=1 we obtain the first equation
4 //With x=0.5 and pf=1 we obtain the second equation
5 A=[1 1;1 0.25]
6 B=[52.2;26.1]
7 W=A\B
8 printf("\n Copper loss=%.1f kW \n",W(2))
9 printf("\n Iron loss=%.1f kW \n",W(1))
10 //Now if x=0.6 and pf=1
11 n= (0.6*600*1/((0.6*600*1)+W(1)+((0.6^2)*W(2))))*100
12 printf("\n Efficiency=%.2f percent \n",n)

```

Scilab code Exa 5.22 Example number 22

```

1 //Ex5.22 ,Pg5.23
2 clc;
3 flkva=150 //Given
4 Wi=1.4 //Iron loss in kW
5 Wcu=1.6 //Copper loss in kW
6 //(a)
7 lkva=flkva*sqrt(Wi/Wcu)
8 printf("\n Load kVA=%.2f kVA \n",lkva)
9 //For maximum efficiency Wi=Wcu=1.4kW and pf=0.8
10 n= (lkva*0.8/((lkva*0.8)+Wi+Wcu))*100
11 printf("\n Efficiency=%.2f percent \n",n)
12 //(b)

```



```

13 n= (0.5*flkva*0.8/((0.5*flkva*0.8)+Wi+(0.5^2)*Wcu))
    *100
14 printf("\n Efficiency=%0.2f percent \n",n)

```

Scilab code Exa 5.23 Example number 23

```

1 //Example5.23 ,Pg5.24
2 clc;
3 flkva=100 //Full load kVA given
4 x=1 //Full load
5 pf=0.8 //Power factor lagging
6 A=[1 1;1 -0.64]
7 B=[2.474;0]
8 W=A\B
9 n= (x*flkva*pf/((x*flkva*pf) + W(1) +(x^2)*W(2)))
    *100
10 printf("\n Efficiency=%0.2f percent \n",n)

```

Scilab code Exa 5.28 Example number 28

```

1 //Example5.28 ,Pg5.28
2 clc;
3 Wi=1 //Iron loss in kW
4 op=50*0.8*10+25*0.6*10+0*4
5 Wcu=1.2 //Copper loss in kW
6 Culoss=1*1.2*10+(25/50)*1.2*10+0 //Copper loss in
    the entire day considering the load cycle for a
    day as given in the question
7 Iloss=1*24
8 nallday= (op/(op+Iloss+Culoss))*100
9 printf("\n All day efficiency=%0.2f percent \n",
    nallday)

```

Chapter 6

Electrical Machines

Scilab code Exa 6.1 Example 1

```
1 //Chapter6 ,Pg6.6 ,Ex6.1
2 clc;
3 P=6 //Number of poles in armature
4 phi=0.018 //Flux per pole in Wb
5 N=600 //Angular velocity in rpm
6 Z=840 //Number of conductors
7 A=P //For lap wound armature , number of parallel
    paths=number of poles
8 Eg=(phi*Z*N*P)/(60*A)
9 printf(" \n Eg=%0.1 f V \n" ,Eg)
```

Scilab code Exa 6.2 Example number 2

```
1 //Pg6.6 ,Ex6.2
2 clc;
3 P=6 //Number of poles
4 A=2 //No of parallel paths
5 Z=300 //Number of conductors
```

```

6 N=1000 //Angular velocity
7 Eg=400 //Generated Emf
8 phi=(60*Eg*A)/(Z*N*P)
9 printf("\n phi=%0.4 f Wb\n",phi)

```

Scilab code Exa 6.3 Example number 3

```

1 //Pg6.7,Ex6.3
2 clc;
3 n=80 //Number of slots on armature
4 cps=10 //number of conductors per slot
5 Eg=400 //Generated EMF
6 N=1000 //Angular velocity
7 //part(i)
8 ctotol=n*cps
9 phi=(Eg*60)/(N*ctotol) //Since A=P
10 printf("\n phi=%0.2 f Wb \n",phi)
11 //part(ii)
12 Eg=220
13 N=(Eg*60)/(phi*ctotol)
14 printf("\n N=%0.0 f rpm \n",N)

```

Scilab code Exa 6.4 Example number 4

```

1 //Pg 6.7,Ex6.4
2 clc;
3 P=4 //Number of poles
4 V=200 //Supply voltage
5 Rf=80 //field resistance in ohms
6 Ra=0.1 //Armature resistance in ohms
7 I1=100 //Load current in amperes
8 //part(i)
9 If=V/Rf

```

```

10 printf("\n I1=%0.1 f A \n",I1)
11 Ia=I1+If
12 printf("\n Ia=%0.1 f A \n",Ia)
13 //part(ii)
14 A=P //For lap wound generator
15 cpp=Ia/4
16 printf("\n Current per armature path=%0.3 f A \n",cpp)
17 //Current per armature path=total current divided by
    total number of conductors
18 ///part(iii)
19 Eg=V+(Ia*Ra)+(0.1*2) //Where the last term in the
    addition is brush drop
20 printf("\n Eg=%0.2 f V \n",Eg)

```

Scilab code Exa 6.5 Example number 5

```

1 //Pg 6.5 ,ex6.8
2 clc;
3 V=250 //Terminal voltage
4 I1=450 //Load current
5 Rf=50 //Field resistance in ohms
6 Ra=0.05 //Armature resistance in ohms
7 P=4 //Number of poles
8 phi=0.05 //Flux per pole in Wb
9 If=V/Rf
10 printf("\n If=%0.0 f A \n",If)
11 Ia=I1+If
12 printf("\n Ia=%0.0 f A \n",Ia)
13 Eg=V+(Ia*Ra)
14 printf("\n Eg=%0.2 f V \n",Eg)
15 n=120 //Number of slots in armature
16 cpp=4 //Conductors per slot
17 Z=n*cpp //Total number of conductors on armature
18 A=P //For lap wound generator
19 N=(Eg*60*A)/(phi*Z*P)

```

```
20 printf("\n N=%0.0 f rpm \n",N)
```

Scilab code Exa 6.6 Example number 6

```
1 //Ex6.6 ,Pg6.8
2 clc;
3 V=230 //Supply voltage
4 I1=40 //Current in amperes
5 Ra=0.5 //Armature winding
6 Rf=115 //Resistance in ohms
7 //Generator operation
8 disp("Generator operation")
9 I1=40 //Load current in amperes
10 If=V/Rf
11 printf("\n If=%0.0 f A \n",If)
12 Ia=I1+If
13 printf("\n Ia=%0.0 f A \n",Ia)
14 Eg=V+(Ia*Ra)
15 printf("\n Eg=%0.0 f V \n",Eg)
16 //Motor operation
17 disp("Motor operation")
18 I1=40
19 If=2
20 Ia=I1-If
21 printf("\n Ia=%0.0 f A \n",Ia)
22 Eb=V-(Ia*Ra)
23 printf("\n Eb=%0.0 f V \n",Eb)
24 n=Eb/Eg
25 printf("\n N2/N1=% .4 f \n",n)
```

Scilab code Exa 6.7 Example number 7

```
1 //Ex6.7
```

```
2  clc;
3  V=100
4  Il=200
5  Rs=0.03
6  Rf=60
7  Ra=0.04
8  Vsfw=Il*Rs
9  printf("\n Voltage drop in series field winding =%.0
        f V \n",Vsfw)
10 If=(V+(Il*Rs))/Rf
11 printf("\n If=%.2 f A \n",If)
12 Ia=Il+If
13 printf("\n Ia=%.2 f A \n",Ia)
14 Eg=V+(Il*Rs)+(Ia*Ra)
15 printf("\n Generated EMF=%.2 f V \n",Eg)
```

Chapter 7

Semiconductor devices and rectifiers

Scilab code Exa 7.1 Calculation of base current

```
1 //Chapter7 ,Pg7.4 ,Ex1
2 clc;
3 I=(20-4)/2.2*10^3 //Diode D1 will be forward biased
   and diode D2 will be reverse biased
4 printf("\n I=%0.2 f mA \n",I*10^-3)
```

Scilab code Exa 7.2 Calculation of alpha dc

```
1 //Chapter7 ,Pg7.4 ,Ex7.2
2 clc;
3 Bdc=90 //
4 Ic=15 //Collector current
5 Ib=Ic/Bdc
6 printf("\n Ib=%0.2 f uA \n",Ib*10^3)
7 Ie=Ib+Ic
8 printf("\n Emitter current Ie=%0.2 f mA \n",Ie)
```

```
9 Adc=Bdc/(Bdc+1)
10 printf("\n Adc=%0.2 f \n",Adc)
```

Scilab code Exa 7.4 Calculation of collector current

```
1 //Chapter 7,Ex7.4 ,Pg7.15
2 clc;
3 B=100
4 Icbo=4 //current in microamperes
5 Ib=40 //Current in microamperes
6 Ic=B*Ib+(B+1)*Icbo
7 printf("\n Ic=%0.1 f mA \n",Ic*10^-3)
```

Scilab code Exa 7.5 Calculation of emitter current

```
1 //Chapter7 ,Ex7.5 ,Pg7.15
2 clc;
3 B=50
4 Ib=20 //Base current in microamperes
5 Ic=B*Ib
6 printf("\n Ic=%0.0 f mA \n",Ic*10^-3)
7 Ie=Ic+Ib
8 printf("\n Ie=%0.2 f mA \n",Ie*10^-3)
```

Scilab code Exa 7.6 Calculation of base current

```
1 //Chapter 7,Ex7.6 ,Pg 7.15
2 clc;
3 a=0.9
4 Ie=10^-3
```



```

5 Ic=a*Ie //a=Ic/Ie
6 Ib=Ie-Ic
7 printf("\n Ib=%0.1 f mA \n",Ib*10^3)

```

Scilab code Exa 7.7 Calculation of base current

```

1 //Chapter 7,Ex 7.7,Pg 7.15
2 clc;
3 a=0.98
4 Vce=0.2
5 Ic=2*10^-3
6 Vcc=12
7 Rc=4
8 b=a/(1-a)
9 printf("\n Beta=%0.0 f \n",b)
10 Ice=(Vcc-Vce)/Rc
11 printf("\n Ic=%0.2 f mA \n",Ic*10^3)
12 Ib=Ic/b
13 printf("\n Ib(sat)=%0.2 f uA \n",Ib*10^6)

```

Scilab code Exa 7.13 Calculation of Idc

```

1 //Chapter 7,Ex7.13,Pg7.30
2 clc;
3 Vrms=66.64
4 Rl=15
5 Vm=sqrt(2)*Vrms
6 printf("\n Vm=%0.2 f V \n",Vm)
7 Im=Vm/Rl
8 printf("\n Im=%0.2 f A \n",Im)
9 Idc=Im/%pi
10 printf("\n Idc=%0.0 f A \n",Idc)

```

Scilab code Exa 7.14 Calculation of peak value of current

```
1 //Chapter 7,Ex7.14 ,Pg7.30
2 clc;
3 Vdc=300
4 Rl=3000
5 Vm=Vdc*%pi/2 //For full wave rectifier
6 printf("\n Vm=%0.2 f V \n",Vm)
7 Vrms=Vm/sqrt(2) //RMS value of secondary voltage
8 Im=Vm/Rl //Peak diode current
9 printf("\n Im=%0.2 f A \n",Im)
```

Scilab code Exa 7.16 Calculation of Vrms

```
1 //Chapter 7,Ex7.16 ,Pg7.30
2 clc;
3 Vdc=50
4 Rl=800
5 Rf=25
6 Vm=(Vdc*%pi*(Rf+Rl))/Rl
7 printf("\n Vm=%0.0 f \n",Vm)
8 Vrms=Vm/sqrt(2)
9 printf("\n Vrms=%0.2 f V \n",Vrms)
```

Scilab code Exa 7.17 Calculation of percent regulation

```
1 //Chapter 7,Ex 7.17 ,Pg 7.31
2 clc;
3 Rf=1
```

```

4 Idc=100
5 Vrms=12.6
6 Rs=3
7 Vm=sqrt(2)*Vrms
8 printf("\n Vm=%0.2 f V \n",Vm)
9 Im=Idc*%pi
10 printf("\n Im=%0.3 f mA \n",Im)
11 //Let us use the formula Im=Vm/(Rs+Rf+Rl) to obtain
    the value of Rl
12 Rl=(17.82-Im*(Rs+Rf))/Im
13 printf("\n Rl=%0.2 f V \n",Rl)
14 Vdc=Idc*Rl
15 printf("\n Vdc=%0.3 f V \n",Vdc)
16 Vnl=Vm/%pi
17 Vf1=Idc*Rl
18 percentreg=((Vnl-Vf1)/Vnl)*100
19 printf("\n Percent regulation=%0.2 f \n",percentreg
    *10^-3)

```

Scilab code Exa 7.18 To find out voltage across conducting diode

```

1 //Chapter7 ,Example 7.18 ,Pg 7.32
2 clc;
3 Vrms=20 //Root mean square voltage
4 Rl=500 //Load resistance in ohms
5 Rf=20 //diode forward resistance
6 Vm=sqrt(2)*Vrms
7 printf("\n Vm=%0.2 f V \n",Vm)
8 Im=Vm/(Rf+Rl)
9 printf("\n Im=%0.5 f A \n",Im)
10 Idc=2*Im/%pi
11 printf("\n Idc=%0.2 f mA \n",Idc*10^3)
12 Vdc=(2*Vm/%pi)-Idc*Rf
13 printf("\n Vdc=%0.2 f V \n",Vdc)
14 Irms=Im/sqrt(2)

```

```

15 printf("\n Irms=%0.2 f mA \n",Irms*10^3)
16 Pi=(Irms^2)*(Rf+Rl)
17 printf("\n Input power=%0.3 f W \n",Pi)
18 r=sqrt(((Irms/Idc)^2)-1)
19 printf("\n Ripple factor=%0.3 f \n",r)
20 vcd=Idc*Rf
21 printf("\n Voltage across conducting diode=%0.4 f V \n
    ",vcd)
22 disp(" Voltage across non conducting diode=20V")

```

Scilab code Exa 7.19 Percentage regulation

```

1 //Chapter7.19 ,Ex7.19 ,Pg7.33
2 clc;
3 Vrms=40
4 Rf=1 //Diode forward resistance in ohms
5 Rl=19 //load resistance
6 Vm=sqrt(2)*Vrms
7 printf("\n Vm=%0.2 f V \n",Vm)
8 Im=Vm/(Rf+Rl)
9 Idc=(2*Im)/%pi
10 printf("\n Idc=%0.1 f A \n",Idc)
11 Pdc=(Idc^2)*Rl
12 printf("\n DC load power=%0.1 f W \n",Pdc)
13 Pac=((Im/sqrt(2))^2)*(Rf+Rl)
14 printf("\n Pac=%0.2 f W \n",Pac)
15 n=(Pdc/Pac)*100
16 printf("\n Efficiency=%0.2 f percent \n",n)
17 Vnl=(2*Vm)/%pi
18 Vf1=Idc*Rl
19 printf("\n Vf1=%0.1 f V \n",Vf1)
20 percentreg=((Vnl-Vf1)/Vnl)*100
21 printf("\n Percentage Regulation=%0.2 f percent \n",
    percentreg)

```

Scilab code Exa 7.21 Peak inverse voltage

```
1 //Chapter7 , Ex7.21 , Pg7.36
2 clc;
3 Vrms=250
4 Rl=3000
5 IdcRf=1
6 Vm=Vrms*sqrt(2)
7 printf("\n Vm=%0.2 f V \n",Vm)
8 Vdc=(2*Vm/%pi)-IdcRf
9 printf("\n Vdc=%0.3 f V \n",Vdc)
10 Idc=Vdc/Rl
11 printf("\n Idc=%0.4 f A \n",Idc)
12 Pdc=(Idc^2)*Rl
13 printf("\n Pdc=%0.2 f W \n",Pdc)
14 Rf=1/Idc
15 printf("\n Rf=%0.2 f ohms \n",Rf)
16 Irms=Vm/((Rf+Rl)*sqrt(2))
17 printf("\n Irms=%0.3 f A \n",Irms)
18 Pac=(Irms^2)*(Rf+Rl)
19 printf("\n Pac=%0.2 f W \n",Pac)
20 PIV=2*Vm //Peak inverse voltage
21 printf("\n PIV=%0.1 f V \n",PIV)
```
