Scilab Textbook Companion for Electronics A Systems Approach by Neil Storey[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

Basic Electrical Circuits and Components

Scilab code Exa 1.1 Example 1

```
//Chapter 1, Example 1.1

clc
//Initialisation
v1=15.8                                         //voltage
v2=12.3                                         //voltage
r=220                                           //
   resistance in ohm

//Calculation
v=v1-v2                                        //voltage
i=v/r                                       //current in
   ampere

//Results
printf("Current, I = %.1f mA",(i*1000))
```

Scilab code Exa 1.2 Example 2

```
//Chapter 1, Example 1.2

clc
//Initialisation
i1=10                                   //current in ampere
i3=3                                    //current in ampere

//Calculation
i2=i1-i3                                //current in ampere

//Results
printf("Current, I = %.1f A",i2)
```

Scilab code Exa 1.3 Example 3

```
//Chapter 1, Example 1.3

clc
//Initialisation
v2=7                                    //voltage
e=12                                    //emf

//Calculation
v1=e-v2                                 //voltage

//Results
printf("Voltage, V = %.1f V",v1)
```

Scilab code Exa 1.4 Example 4

```
//Chapter 1, Example 1.4

clc
//Initialisation
r=50                                        //resistance
    in ohm
i=3                                     //current in
   ampere



//Calculation
p=i^2*r                                    //Power in
   watts

//Results
printf("Power P = %.1f Watt",p)
```

Scilab code Exa 1.5 Example 5

```
//Chapter 1, Example 1.5

clc
//Initialisation
r1=10                                        //
   resistance in ohm
r2=20                                        //
   resistance in ohm
r3=15                                        //
   resistance in ohm
r4=25                                        //
   resistance in ohm

```

```
//Calculation
r=r1+r2+r3+r4                                        //
    resistance in ohm


//Results
printf("Equivalent Resistance, R = %d Ohm",r)
```

Scilab code Exa 1.6 `Example 6`

```
//Chapter 1, Example 1.6

clc
//Initialisation
r1=10                                      //
    resistance in ohm
r2=20                                      //
    resistance in ohm





//Calculation
r=(r1*r2)/(r1+r2)
                                        //resistance
    in ohm


//Results
printf("Equivalent Resistance, R = %.2f Ohm",r)
```

Scilab code Exa 1.7 Example 7

```
//Chapter 1, Example 1.7

clc
//Initialisation
v1=10                                       //voltage
v2=0                                        //voltage
r1=200                                          //
   resistance in ohm
r2=300                                          //
   resistance in ohm


//Calculation
v=v1*(r2/(r1+r2))                                       //
   voltage


//Results
printf("Voltage, V = %d V",v)
```

Scilab code Exa 1.8 Example 8

```
//Chapter 1, Example 1.8

clc
//Initialisation
v1=15                                       //voltage
v2=3                                        //voltage
r1=1000                                          //
   resistance in ohm
```

```
r2=500                                                    //resistance in ohm


//Calculation
v=v2+((v1-v2)*(r2/(r1+r2)))                               //voltage


//Results
printf("Voltage, V = %d V",v)
```

Scilab code Exa 1.9 Example 9

```
//Chapter 1, Example 1.9

clc
//Initialisation
f=50                                 //Frequency in Hertz


//Calculation
t=1/f                                //Time Period in Sec


//Results
printf("Time Period, T = %d ms",(t*1000))
```

Chapter 2

Measurement of Voltages and Currents

Scilab code Exa 2.1 Example 1

```
//Chapter 2, Example 2.1
clc
//Initialisation
t=0.02                          //time period in sec,
   from graph
v1=7                            //position peak voltage,
    from graph
v2=7                            //negative peak voltage,
    from graph

//Calculation
f=1/t                           //frequency in hertz
vpp=v1+v2                       //peak to peak voltage

//Result
printf("Period T = %.2f sec\n",t)
printf("Frequency F = %d Hz\n",f)
printf("Peak Voltage, Vp = %d V\n",v1)
printf("Peak to Peak Voltage, Vpp = %d V\n",vpp)
```

Scilab code Exa 2.2 Example 2

```
//Chapter 2, Example 2.2
clc
//Initialisation
t=50*10^-3                          //time period in sec
    , from graph
v1=10                               //position peak voltage
    , from graph
pi=3.14

//Calculation
f=1/t                               //frequency in hertz
w=2*pi*f                            //angular velocity

//Result
printf("Equation of Voltage signal is, \n")
printf("v = %d sin %d t",v1,round(w))
```

Scilab code Exa 2.3 Example 3

```
//Chapter 2, Example 2.3
clc
//Initialisation
vp=10                               //voltage
f=10                                //frequency in hertz
pi=3.14                             //pi
phi=90                               //phase angle

//Calculation
w=2*pi*f                             //angular frequency
```

```
//Results
printf("%d sin( %d t - %d)",vp,round(w),phi)
```

Scilab code Exa 2.4 Example 4

```
//Chapter 2, Example 2.4
clc
//Initialisation
v1=5                    //voltage
v2=5                    //voltage
r=10                    //resistance in ohm



//Calculation
p1=v1^2/r                //Power in watt when a
    constant 5 V applied
p2=v2^2/r                //Power in watt when a sine
    wave of 5 V r.m.s is applied
p3=((v1^2)/2)/r          //Power in watt when a sine
    wave of 5 V peak is applied

//Result
printf("(a) P = %.1f W\n",p1)
printf("(b) Pav = %.1f W\n",p2)
printf("(c) Pav = %.2f W\n",p3)
```

Scilab code Exa 2.6 Example 6

```
//Chapter 2, Example 2.6
```

```
clc
//Initialisation
i2=1*10^-3                       //full scale deflection current in ampere
v=50                             //full scale deflection voltage
r=25                            //resistance in ohm

//Calculation
i3=1/i2                       //reduction of the sensitivity of the meter
R=v/i2                         //Resistance in ohm
rse=R-r                         //Resistance in ohm

//Result
printf("Series Resistance, Rse = %.3f Kohm\n",rse/1000)
printf(" \t\t\t    %.1f Kohm",rse/1000)
```

Chapter 3

Resistance and DC Circuits

Scilab code Exa 3.1 `Example 1`

```
//Chapter 3, Example 3.1

clc
//Initialisation '
i1=8                        //current in amp
i2=1                        //current in amp
i3=4                        //current in amp

//Calculation
i4=i3+i2-i1                         //current in amp


//Results
printf("Current, I4 = %d A",i4)
```

Scilab code Exa 3.2 `Example 2`

```
//Chapter 3, Example 3.2
```

```

clc
//Initialisation '
v1=3                                    //voltage
v3=3                                    //voltage
e=12                                    //voltage

//Calculation
v2=v1+v3-e                                      //voltage

//Results
printf("Voltage , V = %d V",v2)
```

Scilab code Exa 3.3 Example 3

```
//Chapter 3, Example 3.3
clc
//Initialisation
v1=30                                   //voltage
r1=10*10**3                             //resistance in ohm
r2=10*10**3                             //resistance in ohm
r3=10*10**3                             //resistance in ohm

//Calculation
voc=v1/2                             //open circuit voltage
r23=(r2*r3)/(r2+r3)                  //resistance in parallel in ohm
rt=r1+r23                            //resistance in ohm
i1=v1/rt                             //current in ampere
isc=i1/2                             //short circuit current in ampere
R=voc/isc                            //resistance in ohm


//Results
```

```
printf("For Thevenin Circuit \n")
printf("V = %d V\n",voc)
printf("R = %d kOhm\n\n",R/1000)
printf("For Norton Circuit \n")
printf("I = %d mA\n",isc*1000)
printf("R = %d kOhm",R/1000)
```

Scilab code Exa 3.4 Example 4

```
//Chapter 3, Example 3.4
clc

R1=25                    //resistance in ohm
R2=400                   //resistance in ohm

//To solve simultaneous equation by converting them into matrices form
a=[R1 -2;R2 -8]
b=[50;3200]
x=a\b

//Results
printf("Voc = %d V\n",x(1))                    //display voltage Voc
printf("R = %d Ohm",x(2))                      //display Resistance R
```

Scilab code Exa 3.5 Example 5

```
//Chapter 3, Example 3.5

clc
//Initialisation'
```

```
v1=15                                   //voltage
v2=20                                   //voltage
r1=100                                  //resistance in ohm
r2=200                                 //resistance in ohm
r3=50                                 //resistance in ohm

//Calculation
rp1=(r2*r3)/(r2+r3)                                //resistance in parallel in ohm
vp1=v1*(rp1/(r1+rp1))                                 //voltage V2
rp2=(r1*r3)/(r1+r3)                                //resistance in parallel in ohm
vp2=v2*(rp2/(r2+rp2))                                 //voltage V2
vp=vp1+vp2                                   // total voltage

//Results
printf("Voltage, V = %.2f V",vp)
```

Scilab code Exa 3.6 Example 6

```
//Chapter 3, Example 3.6

clc
//Initialisation'
v1=5                                   //voltage
i=2                                     //current in ampere
r1=10                                  //resistance in ohm
r2=5                                  //resistance in ohm

//Calculation
i1=v1/(r1+r2)                                    //current in ampere
r=(r1*r2)/(r1+r2)                                 //resistance
```

```
    in ohm
v=i*r                              //voltage
i2=v/r2                                //current in
    ampere
i3=i1+i2                                //current in
    ampere

//Results
printf("Current, I = %.2f A",i3)
```

Scilab code Exa 3.7 `Example 7`

```
//Chapter 3, Example 3.7
clc
//Initialisation
v1=50                              //voltage
v2=15                              //voltage
v3=100                              //voltage
r1=10                              //resistance in ohm
r2=20                             //resistance in ohm
r3=30                             //resistance in ohm
r4=25                             //resistance in ohm

//Calculation
//by making a two linear equations, and solving them
     by matrix method
a=[(-13/60) (1/20);(1/60) (-9/100)]
b=[-5;(-100/30)]
x=a\b
I1=x(2)/25                   //current in ampere

//Results
printf("Current, I1 = %.1f A",I1)
```

Scilab code Exa 3.8 Example 8

```
//Chapter 3, Example 3.8
clc
Re=10                         //resistance in ohm
//To solve simulataneous equation by converting them
    itno matrices form
a=[-160 20 30;20 -210 10;30 10 -190]
b=[-50;0; 0]
x=a\b
Ve=Re*(x(3)-x(2))                     //voltage

//Results
printf("I1 = %.2f mA\n",x(1)*1000)
printf("I2 = %.2f mA\n",x(2)*1000)
printf("I3 = %.2f mA\n",x(3)*1000)
printf("Voltage, VE = %.2f V\n",Ve)
```

Chapter 4

Capacitance and Electric Fields

Scilab code Exa 4.1 Example 1

```
//Chapter 4, Example 4.1

clc
//Initialisation '
c=10^-5                          //capacitance in farad
v=10                             //voltage


//Calculation
q=c*v                            //charge in coulombs



//Results
printf("Charge, Q = %d uC",(q*10^6))
```

Scilab code Exa 4.2 Example 2

```
//Chapter 4, Example 4.2

clc
//Initialisation
eo=8.85*10^-12                  //dielectric constant
er=100                        //relative permittivity
a=10*10^-3*25*10^-3           //area in metre
d=7*10^-6                     //distance between plates




//Calculation
c=(eo*er*a)/d                         //capacitance in
    farad



//Results
printf("Capacitance, C = %.1f nF",c*10^9)
```

Scilab code Exa 4.3 Example 3

```
//Chapter 4, Example 4.3

clc
//Initialisation
v=100                          //voltage
d=10^-5                     //distance between plates




//Calculation
e=v/d                      //capacitance in farad
```

```
//Results
printf("Electric Field Strength , E = %d ^ 7 V/m",e
    *10^-6)
```

Scilab code Exa 4.4 Example 4

```
//Chapter 4, Example 4.4

clc
//Initialisation
q=15*10**-6                          //charge in coulomb
a=200*10**-6                         //area in meter


//Calculation
d=q/a                               //electric flux density



//Results
printf("Electric Flux Density , D = %d mC/m^2",d
    *10**3)
```

Scilab code Exa 4.5 Example 5

```
//Chapter 4, Example 4.5

clc
//Initialisation '
```

```
c1=10*10**-6                          //capacitance in farad
c2=25*10**-6                          //capacitance in farad


//Calculation
c=c1+c2                     //capacitance in farad



//Results
printf("Total Capacitance, C = %d uF",c*10**6)
```

Scilab code Exa 4.6 `Example 6`

```
//Chapter 4, Example 4.6

clc
//Initialisation'
c1=10*10**-6                          //capacitance in farad
c2=25*10**-6                          //capacitance in farad


//Calculation
c=(c1*c2)/(c1+c2)                     //equivalent parallel capacitance in farad



//Results
printf("Total Capacitance, C = %.2f uF",c*10**6)
```

Scilab code Exa 4.7 `Example 7`

```
//Chapter 4, Example 4.7

clc
//Initialisation
c=10**-5                            //capacitance in farad
v=100                                //voltage


//Calculation
e=(1/2)*c*v**2                           //energy stored



//Results
printf("Energy Stored, C = %d mJ",e*10**3)
```

Chapter 5

Inductance and Magnetic Fields

Scilab code Exa 5.1 Example 1

```
//Chapter 5, Example 5.1

clc
//Initialisation '
i=5                              //current in amp
r=100*10**-3                     //radius in meter
pi=3.14                          //pi

//Calculation
l=2*pi*r                          //circumference
h=i/l                             //magnetic field
   strength



//Results
printf("Magnetic field strength, H = %.2f A/m",h)
```

Scilab code Exa 5.2 Example 2

```
//Chapter 5, Example 5.2

clc
//Initialisation '
i=6                           //current in amp
n=500                         //no of turns
l=0.4                          //mean circumference
pi=3.14                       //pi
uo=4*pi*10**-7                 //dielectric constant
a=300*10**-6                   //area

//Calculation
f=i*n                            //force
h=f/l                          //magnetic field strength
B=uo*h                        //magnetic induction
phi=B*a                        //total flux

//Results
printf("(a) Force F = %d ampere-turns\n",f)
printf("(b) Magnetic Field Strength, H = %d A/m\n",h)
printf("(c) Magnetic Induction, B = %.2f mT\n",B*10**3)
printf("(d) Total Flux, phi = %.2f uWb\n",phi*10**6)
```

Scilab code Exa 5.3 Example 3

```
//Chapter 5, Example 5.3

clc
//Initialisation'
di=3                          //change in current w.r.t time
l=10*10**-3                   //inductance in henry

//Calculation
v=l*di                        //voltage induced

//Results
printf("Voltage Induced V = %d mV",v*10**3)
```

Scilab code Exa 5.4 Example 4

```
//Chapter 5, Example 5.4

clc
//Initialisation'
n=400                         //no of turns
l=200*10**-3                  //mean circumference
pi=3.14                       //pi
uo=4*pi*10**-7                //dielectric constant
a=30*10**-6                   //area

//Calculation
L=(uo*a*n**2)/l               //inductance

//Results
printf("Inductance L = %d uH",L*10**6)
```

Scilab code Exa 5.5 Example 5

```
//Chapter 5, Example 5.5

clc
//Initialisation '
L1=10                        //inductance
L2=20                        //inductance


//Calculation
Ls=L1+L2                                           //inductance in series
Lp=(L1*L2)/(L1+L2)                                 //inductance in parallel

//Results
printf("(a) Inductance in Series Ls = %d H\n",Ls)
printf("(b) Inductance in Parallel Lp = %.2f H\n",Lp)
```

Scilab code Exa 5.6 Example 6

```
//Chapter 5, Example 5.6

clc
//Initialisation '
L=10**-2                        //inductance
I=5                              //current in ampere


//Calculation
e=(1/2)*L*I**2                    //stored energy

//Results
```

```
printf("Stored Energy = %d mJ",e*10**3)
```

Chapter 6

Alternating Voltages and Currents

Scilab code Exa 6.1 Example 1

```
//Chapter 6, Example 6.1
clc
//Initialisation
w=1000                          //angular frequency
L=10**-3                        //inudctance in henry


//Calculation
Xl=w*L                           //reactance in ohm

//Results
printf("Reactance, Xl = %d Ohm",Xl)
```

Scilab code Exa 6.2 Example 2

```
//Chapter 6, Example 6.2
```

```
clc
//Initialisation
pi=3.14                                   //pi
f=50                                      //frequency in hertz
C=2*10**-6                                //capacitance in farad


//Calculation
w=2*pi*f                                   //angular frequency
Xc=1/(w*C)                                 //Capacitive
    Reactance

//Results
printf("Reactance , Xc = %.2f KOhm",Xc/1000)
```

Scilab code Exa 6.3 Example 3

```
//Chapter 6, Example 6.3
clc
//Initialisation
pi=3.14                                   //pi
f=100                                      //frequency in hertz
L=25*10**-3                                //inductance in henry
vl=5                                       //peak voltage

//Calculation
w=2*pi*f                                   //angular frequency
Xl=w*L                                     //inductive reactance
il=vl/Xl                                   //peak current

//Results
printf("Peak Current , IL = %d mA",il*1000)
```

Scilab code Exa 6.4 Example 4

```
//Chapter 6, Example 6.4
clc
//Initialisation
w=25                    //angular frequency
C=10*10**-3             //capacitance in farad
Ic=2                    //current in ampere

//Calculation

Xc=1/(w*C)              //Capacitive Reactance
Vc=Ic*Xc                //voltage across capacitor

//Results
printf("Voltage, V = %d V r.m.s",Vc)
```

Scilab code Exa 6.5 Example 5

```
//Chapter 6, Example 6.5
clc
//Initialisation
pi=3.14                 //pi
f=50                    //frequency in hertz
i=5                     //current in ampere
r=10                    //resistance in ohm
L=25*10**-3             //inductance in henry
VL=39.3                 //from phasor diagram
VR=50                   //from phasor diagram


//Calculation
```

```
Vr=i*r                                  //voltage across resistor
w=2*pi*f                               //angular frequency
Xl=w*L                                 //inductive reactance
Vl=i*Xl                               //voltage across inductor
V=sqrt(VR**2+VL**2)                    //voltage
phi=atan(VL/VR)                        //phase angle

//Results
printf("Voltage, V = %.1f V\n",V)
printf("Phase Angle, phi = %.1f Degree",phi*180/pi)
```

Scilab code Exa 6.6 Example 6

```
//Chapter 6, Example 6.6
clc
//Initialisation
C=3*10**-8                             //capacitance in farad
pi=3.14                               //pi
f=10**3                                  //frequency in hertz
V=10                                   //voltage
R=10**4                                  //resistance in ohm
i=5                                   //current in ampere
r=10                                     //resistance in ohm
L=25*10**-3                            //inductance in henry
VL=39.3                                //from phasor diagram
VR=50                                 //from phasor diagram


//Calculation
w=2*pi*f                               //angular frequency
Xc=1/(w*C)                              //capacitive
```

```
   reactance in ohm
I=sqrt((V**2)/(R**2+Xc**2))        //current in ampere
phi=atan(Xc/R)                     //phase angle

//Results
printf("Current , I = %d uA\n",I*10**6)
printf("Phase Angle , phi = %.2f Degree",phi*180/pi)
             //wrong answer in textbook
```

Scilab code Exa 6.7 Example 7

```
//Chapter 6, Example 6.7
clc
//Initialisation
pi=3.14                            //pi
f=50                               //frequency in hertz
L=400*10**-3                       //inductance in hemry
C=50*10**-6                        //capacitance in farad
R=200                              //resistance in ohm

//Calculation
w=2*pi*f                            //angular frequency
Xl=w*L                              //inductive reactance
Xc=1/(w*C)                          //Capacitive
   Reactance
X=Xl-Xc                              //Complex part

//Results
printf("Complex Impedance = %d + j %d Ohm",R, round(
   X))
```

Scilab code Exa 6.8 Example 8

```
//Chapter 6, Example 6.8
clc
funcprot(0)
//Initialisation
C=200*10**-6                          //capacitance in farad
R1=5                                 //resistance in ohm
R2=50                                 //resistance in ohm
L=50*10**-3                           //inductance in henry
pi=3.14                              //pi
w=500                                 //angular frequency
v=10                                  //voltage

//Calculation
Z1=R1-(%i*(1/(w*C)))                                   //impedance in complex form
Z2=((R2*w**2*L**2)+(%i*R2**2*w*L))/(R2**2+(w**2*L**2))                                   //impedance in complex form
Z=Z2/(Z1+Z2)                                                    //impedance in complex form
V0=v*Z


function [r,th]=rect2pol(x,y)
//rectangle to polar coordinate conversion
//based on "Scilab from a Matlab User's Point of View", Eike Rietsch,
2002
  r=sqrt(x^2+y^2);
  th = atan(y,x)*180/%pi;
endfunction

[r,th]=rect2pol(real(V0),imag(V0))                     //calling a function

//Results
```

```
printf("vo = %.1f sin( %d t + %.1f )",r,w,th)
```

Chapter 7

Power in AC Circuits

Scilab code Exa 7.1 `Example 1`

```
//Chapter 7, Example 7.1

clc
//Initialisation '
v=50                                    //voltage
i=5                                     //current
phi=30                                  //angle in degree
pi=3.14                                 //pi

//Calculation
s=v*i                                    //apparent power
p=cos(phi*3.14/180)                               //power factor
ap=s*p                                    //active power

//Results
printf("(a) Apparent Power, S = %d VA\n",s)
printf("(b) Power Factor = %.3f Degree\n",p)
```

```
//wrong answer in textbook
printf("(c) Active Power, P = %.1f W\n",ap)   //wrong answer in textbook
```

Scilab code Exa 7.2 Example 2

```
//Chapter 7, Example 7.2

clc
//Initialisation
s=2000                          //apparent power
p=0.75                          //power factor
v=240                           //voltage
//Calculation

ap=s*p                          //active power
phi=sqrt(1-(p**2))              //phase angle in radians
q=s*phi                         //reactive power in var
i=s/v                           //current in ampere


//Results
printf("(a) Apparent Power, S = %d VA\n",s)
printf("(b) Active Power, P = %d W\n",ap)
printf("(c) Reactive Power, Q = %d var\n",q)
printf("(d) Current, I = %.2f A\n",i)
```

Scilab code Exa 7.3 Example 3

```
//Chapter 7, Example 7.3

clc
//Initialisation
s=2000                                      //apparent power
p=0.75                                  //power factor
v=240                                    //voltage
pi=3.14                                   //pi
f=50                                      //frequency

//Calculation

ap=s*p                                    //active power
phi=sqrt(1-(p**2))                        //phase angle in radians
q=s*phi                               //reactive power in var
i=s/v                                    //current in ampere
xc=-v**2/q                                 //capacitive reactance in ohm
c=1/(xc*2*pi*f)                           //capacitance in farad
s1=ap                                      //new apparent power
i2=s1/v                                    //new current in ampere

//Results
printf("(a) Apparent Power, S = %d VA\n",s1)
printf("(b) Active Power, P = %d W\n",ap)
printf("(c) Reactive Power, Q = %d var\n",q)
printf("(d) Current, I = %.2f A\n",i2)
```

Chapter 8

Frequency Characteristics of AC Circuits

Scilab code Exa 8.1 Example 1

```
//Chapter 8, Example 8.1
clc
//Initialisation
vi=10                          //input voltage
vo=3                          //output voltage
ii=2*10**-3                   //input current in
    ampere
io=5*10**-3                   //output current in
    ampere

//Calculation
av=vo/vi                        //voltage gain
ai=io/ii                        //current gain
ap=(vo*io)/(vi*ii)              //power gain

//Result
printf("Voltage Gain, Av = %.1f\n",av)
printf("Current Gain, Ai = %.1f\n",ai)
printf("Power Gain, Ap = %.2f\n",ap)
```

Scilab code Exa 8.2 Example 2

```
//Chapter 8, Example 8.2
clc
//Initialisation
p=2500                              //power gain

//Calculation
pdb=10*log10(p)                        //power gain
//Result
printf("Power Gain (dB) = %.1f dB\n",pdb)
```

Scilab code Exa 8.3 Example 3

```
//Chapter 8, Example 8.3
clc
funcprot()
//Initialisation
p1=5                              //power gain
p2=50                              //power gain
p3=500                              //power gain
v1=5                              //voltage gain
v2=50                              //voltage gain
v3=500                              //voltage gain


//initialising a function for gain in dB
function [x]=pgain(a)
  x=10*log10(a)
endfunction

```

```
function [x]=vgain(a)
  x=20*log10(a)
endfunction

//calling a functions
[pd1]=pgain(p1)
[pd2]=pgain(p2)
[pd3]=pgain(p3)
[vd1]=vgain(v1)
[vd2]=vgain(v2)
[vd3]=vgain(v3)

//Result
printf("Power Gain (dB) of 5 = %.1f dB\n",pd1)
printf("Power Gain (dB) of 50 = %.1f dB\n",pd2)
printf("Power Gain (dB) of 500 = %.1f dB\n",pd3)
printf("Voltage Gain (dB) of 5 = %.1f dB\n",vd1)
printf("Voltage Gain (dB) of 50 = %.1f dB\n",vd2)
printf("Voltage Gain (dB) of 500 = %.1f dB\n",vd3)
```

Scilab code Exa 8.4 Example 4

```
//Chapter 8, Example 8.4
funcprot()
clc
//Initialisation
p1=20                              //gain
p2=30                              //gain
p3=40                              //gain



//initialising a function for gain
function [x]=pgain(a)              //function for
   power gain
```

```
  x=10**(a/10)
endfunction

function [x]=vgain(a)              //function for
   voltage gain
  x=10**(a/20)
endfunction

//calling a functions
[pd1]=pgain(p1)
[pd2]=pgain(p2)
[pd3]=pgain(p3)
[vd1]=vgain(p1)
[vd2]=vgain(p2)
[vd3]=vgain(p3)

//Result
printf("Power Gain (dB) of 20 = %.1f dB\n",pd1)
printf("Voltage Gain (dB) of 30 = %.1f dB\n\n",vd1)
printf("Power Gain (dB) of 40 = %.1f dB\n",pd2)
printf("Voltage Gain (dB) of 20 = %.1f dB\n\n",vd2)
printf("Power Gain (dB) of 30 = %.1f dB\n",pd3)
printf("Voltage Gain (dB) of 40 = %.1f dB\n",vd3)
```

Scilab code Exa 8.5 Example 5

```
//Chapter 8, Example 8.5
clc
//Initialisation
c=10*10**-6                        //capacitance in
   farad
r=10**3                            //resistance in ohm
pi=3.14                            //pi

//Calculation
```

```
t=c*r                         //time constant
wc=1/t                        //angular frequency
f=wc/(2*pi)                   //cyclic frequency

//Result
printf("Time Constant, T = %.2f s\n",t)
printf("Angular Cut-off Frequency, F = %d rad/s \n",
   wc)
printf("Cyclic Cut-off Frequency, Fc = %.1f Hz\n",f)
```

Scilab code Exa 8.6 Example 6

```
//Chapter 8, Example 8.6
clc
//Initialisation
f1=1000                         //frequency in hertz
f2=10                         //frequency in hertz
f3=100                         //frequency in hertz
f4=20                         //frequency in hertz
f5=10**6                         //frequency in hertz
f6=50                         //frequency in hertz

//Calculation
f11=f1*2                           //an octave above 1
   kHz
f22=f2*2*2*2                           //three octaves
   above 10 Hz
f33=f3/2                           //an octave below
   100 Hz
f44=f4*10                           //a decade above 20
   Hz
f55=f5/10/10/10                           //three decades
   below 1 MHz
f66=f6*10*10                           //two decades above
   50 Hz
```

```
//Result
printf("(a) an octave above 1 kHz = %d kHz \n",f11
    /1000)
printf("(b) three octaves above 10 Hz = %d Hz \n",
    f22)
printf("(c) an octave below 100 Hz = %d Hz \n",f33)
printf("(d) a decade above 20 Hz = %d Hz \n",f44)
printf("(e) three decades below 1 MHz = %d kHz \n",
    f55/1000)
printf("(f) two decades above 50 Hz = %d kHz \n",f66
    )
```

Scilab code Exa 8.7 `Example 7`

```
//Chapter 8, Example 8.7
clc
//Initialisation
c=10*10**-6                        //capacitance in
    farad
r=10**3                            //resistance in ohm
pi=3.14                            //pi

//Calculation
t=c*r                           //time constant
wc=1/t                          //angular frequency
f=wc/(2*pi)                     //cyclic frequency

//Result
printf("Time Constant, T = %.2f s\n",t)
printf("Angular Cut-off Frequency, F = %d rad/s \n",
    wc)
printf("Cyclic Cut-off Frequency, Fc = %.1f Hz\n",f)
```

Scilab code Exa 8.8 Example 8

```
//Chapter 8, Example 8.8
clc
//Initialisation
l=10*10**-3                              //inductance in
   henry
r=100                                     //resistance in ohm
pi=3.14                                  //pi

//Calculation
t=l/r                                //time constant
wc=1/t                               //angular frequency
f=wc/(2*pi)                          //cyclic frequency

//Result
printf("Time Constant, T = %d ^-4 s\n",t*10**5)
printf("Angular Cut-off Frequency, F = %d ^4 rad/s \
   n",wc/10**3)
printf("Cyclic Cut-off Frequency, Fc = %.2f kHz\n",f
   /1000)
```

Scilab code Exa 8.9 Example 9

```
//Chapter 8, Example 8.9
clc
//Initialisation
l=15*10**-3                              //inductance in
   henry
c=30*10**-6                             //capacitance in
   farad
r=5                                     //resistance in ohm
```

```
pi=3.14                                //pi

//Calculation
fo=1/(2*pi*sqrt(l*c))                  //Resonant Frequency
q=(1/r)*sqrt(l/c)                        //Quality Factor
b=r/(2*pi*l)                            //Bandwidth

//Result
printf("Resonant Frequency, Fo = %d Hz \n",fo)
printf("Quality Factor, Q = %.2f\n",q)
printf("Bandwidth, B = %d Hz\n",b)
```

Chapter 9

Transient Behaviour

Scilab code Exa 9.1 Example 1

```
//Chapter 9, Example 9.1

clc
//Initialisation '
C=100*10**3                    //capacitance in farad
R=100*10**-6                          //resistance in
    ohm
t=25                                 //time in
   seconds
V=20                                 //voltage
//Calculation
T=C*R                              //time constant in
   sec
v=V*(1-exp(-t/T))                  //output voltage

//Results
printf("Output Voltage = %.2f V",v)
```

Scilab code Exa 9.2 Example 2

```
//Chapter 9, Example 9.2
clc
//Initialisation
L=400*10**-3                    //inductance in henry
R=20                          //resistance in ohm
V=15                                 //voltage
i=300*10**-3                         //current in amp
e=2.7183                             //exponent

//Calculation
T=L/R                               //time constant in sec
I=V/R                               //current in amp from Ohms Law
t=(log10(I/(I-i))/log10(e))*T      //time period



//Results
printf("t = %.1f ms",t*1000)
```

Chapter 13

Amplification

Scilab code Exa 13.1 Example 1

```
//Chapter 13, Example 13.1

clc
//Initialisation '
ri=10**3                                    //resistance in ohm
rs=100                                  //resistance in ohm
rl=50                                             //resistance in
    ohm
ro=10                                               //resistance
   in ohm
vs=2                                          //voltage
ao=10                                          //output gain

//Calculation
vi=(ri/(rs+ri))*vs                                 //input
   voltage
vo=ao*vi*(rl/(ro+rl))                              //output
   voltage


//Results
```

```
printf("Output Voltage = %.2f V",vo)
```

Scilab code Exa 13.2 Example 2

```
//Chapter 13, Example 13.2

clc
//Initialisation'
ri=10**3                              //resistance in ohm
rs=100                                //resistance in ohm
rl=50                                 //resistance in
   ohm
ro=10                                 //resistance
   in ohm
vs=2                                  //voltage
ao=10                                 //output gain

//Calculation
vi=(ri/(rs+ri))*vs                    //input
   voltage
vo=ao*vi*(rl/(ro+rl))                 //output
   voltage
av=vo/vi                              //voltage
   gain

//Results
printf("Voltage Gain Av = %.2f",av)
```

Scilab code Exa 13.3 Example 3

```
//Chapter 13, Example 13.3

clc
```

```
//Initialisation'
rl=50                                   //resistance in ohm
ro=0                                    //resistance in ohm
vs=2                                    //voltage
ao=10                                   //output gain

//Calculation
vi=vs                        //input voltage
vo=ao*vi*(rl/(ro+rl))                   //output voltage


//Results
printf("Output Voltage = %.2f V",vo)
```

Scilab code Exa 13.4 `Example 4`

```
//Chapter 13, Example 13.1

clc
//Initialisation'
ri=10**3                                //resistance in ohm
rs=100                                  //resistance in ohm
rl=50                                   //resistance in ohm
ro=10                                   //resistance in ohm
vs=2                                    //voltage
ao=10                                   //output gain

//Calculation
vi=(ri/(rs+ri))*vs                      //input voltage
```

```
vo=ao*vi*(rl/(ro+rl))                    //output voltage
po=vo**2/rl                              //output power in watt

//Results
printf("Output Power = %.1f W",po)
```

Scilab code Exa 13.5 Example 5

```
//Chapter 13, Example 13.5

clc
//Initialisation
ri=1000                         //resistance in ohm
rl=50                               //resistance in ohm
vi=1.82                       //input voltage
vo=15.2                     //output voltage



//Calculation

po=vo**2/rl                              //output power in watt
pi=vi**2/ri                              //input power in watt
ap1=po/pi                              //power gain

//Results
printf("Power Gain, Ap = %d",ap1)
```

Scilab code Exa 13.6 `Example 6`

```
//Chapter 13, Example 13.6

clc
//Initialisation '
p=1400                                  //power gain

//Calculation
pdb=10*log10(p)                              //power gain
    in dB

//Results
printf("Power Gain (dB) = %.1f dB",pdb)
```

Chapter 14

Control and Feedback

Scilab code Exa 14.2 Example 2

```
//Chapter 14, Example 14.2
clc
//Initialisation
A1=100000                    //gain of an amplifier A
B=0.0001                    //gain of an amplifier B
A2=200000                    //gain of an amplifier A

//Calculation
G1=A1/(1+(A1*B))               //overall gain
G2=A2/(1+(A2*B))               //overall gain


//Results
printf("if gain of the amplifier A = 100,000\n")
printf("G = %d\n\n",G1)
printf("if gain of the amplifier A = 200,000\n")
printf("G = %d",G2)
```

Chapter 15

Operational Amplifiers

Scilab code Exa 15.4 Example 4

```
//Chapter 15, Example 15.4

clc
//Initialisation
b=2*10**4                          //bandwidth in
   hertz

//Calculation
gain=10**6/b                       //gain

//Results
printf("Gain = %d",gain)
```

Scilab code Exa 15.5 Example 5

```
//Chapter 15, Example 15.5

clc
```

```
//Initialisation
g=2*10**5                              //open loop gain
g2=20                                  //closed loop gain
ro=75                                   //ouput resistance
ri=2*10**6                              //input resistance

//Calculation
ab=g/g2                                 //1 + AB
ro2=ro/ab                               //output resistance in ohm
ri2=ri*ab                               //input resistance in ohm

//Results
printf("Output Resistance = %.1f mOhm\n",ro2*1000)
printf("Input Resistance = %d GOhm",ri2/10**9)
```

Scilab code Exa 15.6 Example 6

```
//Chapter 15, Example 15.6

clc
//Initialisation
g=2*10**5                              //open loop gain
g2=20                                  //closed loop gain
ro=75                                   //ouput resistance
ri=2*10**6                              //input resistance
r1=1000                                 //resistance in ohm

//Calculation
ab=g/g2                                 //1 + AB
ro1=ro/ab                               //output resistance in ohm


```

```
//Results
printf("Output Resistance = %.1f mOhm\n",ro1*1000)
printf("Input Resistance = %d kOhm\n",r1/1000)
```

Scilab code Exa 15.7 `Example 7`

```
//Chapter 15, Example 15.7

clc
//Initialisation
g=2*10**5                        //open loop gain
g2=1                             //closed loop gain
ro=75                            //ouput resistance
ri=2*10**6                       //input resistance

//Calculation
ab=g/g2                          //1 + AB
ro2=ro/ab                        //output resistance in ohm
ri2=ri*ab                        //input resistance in ohm

//Results
printf("Output Resistance = %.1f uOhm\n",ro2*10**6)          //wrong answerin textbook
printf("Input Resistance = %d GOhm",ri2/10**9)
```

Chapter 16

Semiconductors and Diodes

Scilab code Exa 16.1 `Example 1`

```
//Chapter 16, Example 16.1

clc
//Initialisation
e=5                              //emf i volt
r=1000                           //resistance in ohm


//Calculation
i=e/r                             //current in amp
v=0.75                           //voltage across diode from graph shown

//Results
printf("Current = %d mA\n",i*1000)
printf("Voltage = %.2f V",v)
```

Scilab code Exa 16.2 `Example 2`

```
//Chapter 16, Example 16.2
clc
//Initialisation
E=5                          //voltage
R=1000                       //resistance in ohm
Vd=0.7                        //barrier voltage
ron=10                        //internal resistance in
    ohm

//Calculation
I=E/R                         //current in ampere
I1=(E-Vd)/R                   //current in ampere
I2=(E-Vd)/(R+ron)             //current in ampere

//Results
printf("When no voltage drop, I = %d mA\n",I*1000)
printf("When there is conduction voltage of the
   diode, I = %.1f mA\n",I1*1000)
printf("When there is conduction voltage and
   internal resistance if the diode, I2 = %.2f mA\n"
   ,I2*1000)
```

Scilab code Exa 16.3 `Example 3`

```
//Chapter 16, Example 16.3
clc
//Initialisation
vz=3.6                          //voltage
Rl=200                       //resistance in ohm
ron=10                        //internal resistance in
    ohm
R=47                            //chosen value of
   resistor in ohm
V=5.5                            //minimum supply
   voltage
```

```
IL=0.018                           //current in ampere

//Calculation
Il=vz/Rl                           //current in ampere
Pr=(V-vz)**2/R                      //power in watt
Pz=(((V-vz)/R)-IL)*vz                   //power in watt

//Results
printf("Pr(max) = %d mW\n",round(Pr*1000))
printf("Pz(max) = %d mW",round(Pz*1000))
```

Scilab code Exa 16.4 `Example 4`

```
//Chapter 16, Example 16.4

clc
//Initialisation
i=0.2                              //current in ampere
c=0.01                             //capacitance in
   farad
t=20*10**-3                        //time in sec

//Calculation
dv=i/c                             //change in voltage w
   .r.t time
vc=t*dv                            //peak ripple voltage
    on capacitor

//Results
printf("Peak Ripple Voltage = %.1f V",vc)
```

Scilab code Exa 16.5 `Example 5`

```
//Chapter 16, Example 16.5

clc
//Initialisation
dv=20                                //change in voltage w.
   r.t time
t=10*10**-3                           //time in sec

//Calculation
vc=t*dv                               //peak ripple voltage
    on capacitor

//Results
printf("Peak Ripple Voltage = %.1f V",vc)
```

Chapter 17

Field effect Transistors

Scilab code Exa 17.1 Example 1

```
//Chapter 17, Example 17.1
clc
//Initialisation
rd=100*10**3                    //resistance in ohm
gm=2*10**-3                     //in seimens
RD=2*10**3                      //resistance in ohm
RG=10**6                        //resistance in ohm

//Calculation
ro=((rd*RD)/(rd+RD))                                      //Input Resistance
v=-gm*ro                                //Small Signal Voltage Gain
ri=RG                               //Input Resistance

//Results
printf("Small Signal Voltage Gain = %.1f \n",v)
printf("Input Resistance, ri = %d MOhm \n",ri/10**6)
printf("Ouput Resistance, ro = %d kOhm \n",round(ro/10**3))
```

Scilab code Exa 17.2 Example 2

```
//Chapter 17, Example 17.2
clc
//Initialisation
C=10**-6                              //capacitance in farad
RG=10**6                              //resistance in ohm
pi=3.14                               //pi


//Calculation
fc=1/(2*pi*C*RG)                      //frequency in Hz

//Results
printf("Fc = %.2f Hz",fc )
```

Scilab code Exa 17.3 Example 3

```
//Chapter 17, Example 17.3
clc
//Initialisation
VDD=15                                   //voltage
Vq=10                                 //quiescent output
   voltage
VGS=3                                    //voltage
RD=2.5*10**3                             //resistance in Ohm

//Calculation
VR=VDD-Vq                                   //voltage
ID=VR/RD                                  //quiescent drain
   current
Rs=VGS/ID                                 //resistance in ohm
```

```
//Results
printf("Rs = %.1f kOhm\n",Rs/1000)
printf("ID = %d mA\n",ID*1000)
printf("VR = %d V",VR)
```

Scilab code Exa 17.4 `Example 4`

```
//Chapter 17, Example 17.4
clc
//Initialisation
VDD=15                          //voltage
Vq=10                           //quiescent output voltage
RD=2.5*10**3                    //resistance in Ohm
Vp=-6                           //voltage
IDSS=8*10**-3                   //saturation drain current in amp

//Calculation
VR=VDD-Vq                       //voltage
ID=VR/RD                        //quiescent drain current
VGS=Vp*(1-sqrt(ID/IDSS))        //voltage
Rs=VGS/ID                       //resistance in ohm


//Results
printf("Rs = %.1f kOhm\n",-Rs/1000)
printf("ID = %d mA\n",ID*1000)
printf("VGS = %d V\n",VGS)
```

Scilab code Exa 17.5 Example 5

```
//Chapter 17, Example 17.5
clc
//Initialisation
r1=10**6                                   //resistance in ohm
r2=2*10**6                                 //resistance in ohm
Rd=3.3*10**3                               //resistance in ohm
Rs=10**3                                    //resistance in ohm
c=10**-6                                    //capactance in farad
pi=3.14                                     //pi

//Calculation
ri=(r1*r2)/(r1+r2)                         //resistance in R1 & R2 parallel
ro=Rd                                      //output resistance
av=-Rd/Rs                                  //votlage gain
fc=1/(2*pi*ri*c)                           //frequency in Hz

//Results
printf("Input resistance ri = %d kOhm\n",round(ri/1000))
printf("Output resistance ro = %.1f kOhm\n",ro/1000)
printf("Small Signal Voltage Gain = %.1f\n",av)
printf("Fo = %.2f Hz ",fc)
```

Scilab code Exa 17.6 Example 6

```
//Chapter 17, Example 17.6
```

```
clc
//Initialisation
rd=50*100*3                                          //resistance
    in ohm
gm=72*10**-3                                          //in siemens
Rd=3.3*10**3                                       //resistance in
    ohm
Rs=10**3                                            //resistance in
    ohm



//Calculation
av=-Rd/Rs                                          //votlage gain
    from eq 17.7
b=gm*Rd
c=gm*Rs
av1=-(b)/(1+(c)+((Rd+Rs)/rd))          //voltage gain
    from eq 17.8
av2=-(b)/(1+(c))                                  //voltage gain
    from eq 17.9

//Results
printf("From Eq 17.7, Gain = %.1f\n",av)
printf("From Eq 17.8, Gain = %.3f\n",av1)
printf("From Eq 17.9, Gain = %.3f\n",av2)
```

Scilab code Exa 17.7 Example 7

```
//Chapter 17, Example 17.7
clc
//Initialisation
gm=72*10**-3                                          //in siemens
Rd=3.3*10**3                                       //resistance in
    ohm
```

```
//Calculation
b=-gm*Rd                                   //gain of the
    circuit


//Results
printf(" Gain = %.1f\n",round(b))
```

Chapter 18

Bipolar Junction Transistors

Scilab code Exa 18.1 Example 1

```
//Chapter 18, Example 18.1
clc
//Initialisation
VCC=10                              //voltage
VBE=0.7                              //base emitter voltage
RB=910*10**3                        //resistance in ohm
hfe=100                              //HFE parameter of the transistor
RC=4.7*10**3                        //resistance in ohm


//Calculation
IB=(VCC-VBE)/RB                          //base current in ampere
IC=hfe*IB                                 //collector current in ampere
Vq=VCC-(IC*RC)                            //quiescent output voltage


```

```
//Results
printf("Quiescent Output Current = %.2f mA\n",IC
    *1000)
printf("Quiescent Output Voltage = %.1f V\n",Vq)
```

Scilab code Exa 18.2 Example 2

```
//Chapter 18, Example 18.2
clc
//Initialisation
Ie=1.02*10**-3
RB=910*10**3                          //resistance in ohm
hfe=100                                //HFE parameter of
    the transistor
RC=4.7*10**3                          //resistance in ohm
hoe=10*10**-6                                     //HOE
    parameter of the transistor

//Calculation
gm=40*Ie
hie=hfe/(40*Ie)                                   //HIE
    parameter of the transistor
av=-gm*RC/((hoe*RC)+1)                            //small
    signal voltage gain
ri=(RB*hie)/(RB+hie)                              //Input
    Resistance
a1=1/hoe
ro=(RC*a1)/(RC+a1)                                //Output
    Resistance


//Results
printf("Small Signal Voltage Gain = %d \n",av)
printf("Input Resistance = %.1f kOhm \n",ri/1000)
printf("Output Resistance = %.1f kOhm \n",ro/1000)
```

Scilab code Exa 18.3 `Example 3`

```
//Chapter 18, Example 18.3
clc
//Initialisation
VCC=10                    //voltage
R2=10*10**3               //resistance in ohm
R1=27*10**3               //resistance in ohm
RE=1*10**3                //resistance in ohm
RC=2.2                    //resistance in ohm
VBE=0.7                   //base emitter voltage



//Calculation
VB=VCC*(R2/(R1+R2))       //Quiescent base voltage
VE=VB-VBE                 //Quiescent emitter voltage
IE=VE/RE                  //Quiescent emitter current
IC=IE                     //Quiescent collector current
VO=VCC-(IC*RC)            //Quiescent collector voltage




//Results
printf("Quiescent base voltage = %.2f V\n",VB)
printf("Quiescent emitter voltage = %d V\n",VE)
printf("Quiescent emitter current = %d mA\n",IE
```

```
    *1000)
printf("Quiescent collector current = %d mA\n",IC
    *1000)
printf("Quiescent collector voltage = %.1f V\n",VO)
                //wrong answer on textbook
```

Scilab code Exa 18.4 Example 4

```
//Chapter 18, Example 18.4
clc
//Initialisation
RE=1.2*10**3                  //resistance in ohm
RC=2.2*10**3                  //resistance in ohm


//Calculation
av=-RC/RE                     //voltage gain


//Results
printf("Voltage gain = %.1f ",av)          //wrong
    answer in the textbook
```

Scilab code Exa 18.6 Example 6

```
//Chapter 18, Example 18.6
clc
//Initialisation
vcc=15                        //voltage
vc=9.5                        //voltage
ic=10**-3                     //collector
    current
Ie=10**-3                     //emitter current
```

```
RE=5.6*10**3                        //resistance in ohm
RC=1.3*10**3                        //resistance in ohm
R2=13*10**3                          //resistance in ohm, choosen R2 as approximately 10 times RE
pi=3.14                               //pi
fc=10                                  //frequency in hertz


//Calculation
rc=(vcc-vc)/ic                        //resistance in ohm
re=rc/4                           //resistance in ohm
vg=-RC/(RE+re)                        //voltage gain
R1=(R2*(vcc-2))/2                      //resistance in ohm
Ri=(R1*R2)/(R1+R2)                      //input resistance in ohm
c=1/(2*pi*fc*Ri)                        //cut-off frequency



//Results
printf("C = %.1f uF\n",c*10**6)
printf("R1 = %.1f kOhm\n",R1/10**3)
printf("R2 = %d kOhm\n",R2/10**3)
printf("RC = %.1f kOhm\n",rc/10**3)
printf("RE = %.1f kOhm\n",re/10**3)
```

Scilab code Exa 18.7 Example 7

```
//Chapter 18, Example 18.7
clc
//Initialisation
```

```
vcc=15                              //voltage
RC=5.6*10**3                        //resistance in ohm
RE=1.3*10**3                        //resistance in ohm
R2=13*10**3                         //resistance in ohm,
R1=82*10**3                         //resistance in ohm
pi=3.14                             //pi
fc=10                               //frequency in hertz
VBE=0.7                             //base to emitter voltage

//Calculation
VB=vcc*(R2/(R1+R2))                 //Quiescent base voltage
VE=VB-VBE                           //Quiescent emitter voltage
IE=VE/RE                            //Quiescent emitter current
IC=IE                               //Quiescent collector current
VO=vcc-(IC*RC)                      //Quiescent collector voltage



//Results
printf("Quiescent base voltage = %.2f V\n",VB)
printf("Quiescent emitter voltage = %.2f V\n",VE)
printf("Quiescent emitter current = %.2f mA\n",IE*1000)
printf("Quiescent collector current = %.2f mA\n",IC*1000)
printf("Quiescent collector voltage = %.1f V\n",VO)
```

Scilab code Exa 18.8 Example 8

```
//Chapter 18, Example 18.8
clc
//Initialisation
vcc=15                                  //voltage
RC=5.6*10**3                          //resistance in ohm
RE=1.3*10**3                          //resistance in ohm
R2=13*10**3                             //resistance in
    ohm,
R1=82*10**3                             //resistance in
    ohm
pi=3.14                                  //pi
fc=10                                     //frequency in
    hertz
VBE=0.7                                    //base to
    emitter voltage
hfe1=100
hfe2=400

//Calculation
VB=vcc*(R2/(R1+R2))                        //Quiescent
    base voltage
VE=VB-VBE                                  //Quiescent
    emitter voltage
IE=VE/RE                                    //Quiescent
    emitter current
IC=IE                                    //Quiescent
    collector current
VO=vcc-(IC*RC)                            //Quiescent
    collector voltage

re=1/(40*IE)
av=-RC/re                                  //voltage gain
```

```
rp=(R1*R2)/(R1+R2)

//if hfe=100
hie1=hfe1*re
ri1=(rp*hie1)/(rp+hie1)

//if hfe=400
hie2=hfe2*re
ri2=(rp*hie2)/(rp+hie2)

ro=RC

//Results
printf("Small Signal Voltage Gain = %d\n",av)
printf("Small Signal Input Resistance is %d kOhm to
    %.1f kOhm\n",round(ri1/1000),(ri2/1000))
printf("Small Signal Output Resistance is %.1f kOhm\
    n",(RC/1000))
```

Scilab code Exa 18.9 Example 9

```
//Chapter 18, Example 18.9
clc
//Initialisation
R1=2*10**3                    //resistance in ohm
R2=5.2*10**3                    //resistance in ohm
pi=3.14                            //pi
c=2.2*10**-6                          //capacitance in
    farad
ce=10*10**-6                            //capacitance
    in farad
re=24                                   //resistance in
    ohm

//Calculation
```

```
fc1=1/(2*pi*c*R1)                              //cut-off
    frequency

fc2=1/(2*pi*c*R2)                              //cut-off
    frequency

fc=1/(2*pi*ce*re)                               //cut-off
    frequency

//Results
printf("Coupling Capacitor is in the range %d Hz -
    %d Hz\n",round(fc2),round(fc1))
printf("Decoupling Capacitor , Ce = %d Hz",fc)
```

Scilab code Exa 18.10 Example 10

```
//Chapter 18, Example 18.10
clc
//Initialisation
VCC=10                               //voltage
R2=10*10**3                          //resistance in ohm
R1=27*10**3                          //resistance in ohm
RE=100                          //resistance in ohm
RC=2.2                               //resistance in ohm
VBE=0.7                              //base emitter voltage
av=1                                 //small sg voltage gain


//Calculation
VB=VCC*(R2/(R1+R2))                            //Quiescent
    base voltage
VE=VB-VBE                                      //Quiescent
    emitter voltage
IE=VE/RE                                        //Quiescent
    emitter current
```

```
ri=(R1*R2)/(R1+R2)                              //input resistance
ro=1/(40*IE)                                    //output resistance



//Results
printf("Small Signal Voltage Gain = %d\n",av)
printf("Small Signal Input Resistance is %.1f kOhm\n",(ri/1000))
printf("Small Signal Output Resistance is %.2f kOhm\n",(ro))
```

Scilab code Exa 18.11 Example 11

```
//Chapter 18, Example 18.11
clc
//Initialisation
VCC=10                              //voltage
R2=3*10**3                        //resistance in ohm
R1=7*10**3                        //resistance in ohm
RE=10**3                        //resistance in ohm
RC=3*10**3                              //resistance in ohm
VBE=0.7                           //base emitter voltage
av=1                             //small sg voltage gain
RE2=2*10**3                         //resistance in ohm
RC2=4*10**3                                 //resistance in ohm


//Calculation
VB=VCC*(R2/(R1+R2))                          //Quiescent base voltage
```

```
VE=VB-VBE                          //Quiescent emitter voltage
IE=VE/RE                           //Quiescent emitter current
VC1=VCC-(IE*RC)                    //Quiescent collector voltage
VB2=VC1                            //bias voltage
VE2=VB2-VBE                        //emitter voltage
IC2=VE2/RE2                        //collector current in ampere
VC2=VCC-(IC2*RC2)                  //collector voltage
Av=(-RC/RE)*(-RC2/RE2)             //overall gain



//Results
printf("Quiescent output voltage = %.1f V\n",VC2)
printf("Overall Voltage Gain = %d",Av)
```

Chapter 19

Power Electronics

Scilab code Exa 19.1 Example 1

```
//Chapter 19, Example 19.1

clc
//Initialisation
r3=1.222*10**3                          //resistance in ohm
r4=1*10**3                          //resistance in ohm
v1=0.7                              //voltage
vz=4.7

//Calculation
vo=(vz+v1)*((r3+r4)/r4)             //Output Voltage


//Results
printf("Output Voltage Vo = %d V",round(vo))
```

Scilab code Exa 19.2 Example 2

```
//Chapter 19, Example 19.2

clc
//Initialisation
rl=5                    //resistance in ohm
vo=10                   //Output Voltage
vi=15                   //input voltage

//Calculation
io=vo/rl                        //current in ampere
po=vo*io                        //power delivered to load
pt=(vi-vo)*io                   //power delivered to output transistor


//Results
printf("Output Power on Load Po = %d W\n",round(po))
printf("Output Power on O/P Transistor Pt = %d W",round(pt))
```

Chapter 21

Noise and Electromagnetic Compatibility

Scilab code Exa 21.1 `Example 1`

```
//Chapter 21, Example 21.1

clc
//Initialisation

vo=2.5                    //Output Voltage
vi=0.01                    //input voltage

//Calculation
sn=20*log10(vo/vi)             //signal to noise ratio


//Results
printf("S/N Ratio = %d dB",round(sn))
```

Chapter 23

Digital Systems

Scilab code Exa 23.16 Example 16

```
//Chapter 23, Example 23.16

clc
////Initialisation
x="11010"                    //binary number to be
    convert


//Calculation
x1=bin2dec(x)                       //conversion to
    decimal

//Results
printf("Decimal of 11010 = %d",x1)
```

Scilab code Exa 23.17 Example 17

```
//Chapter 23, Example 23.17
```

```
clc
//Initialisation
x=26                //decimal number to be convert


//Calculation
z1=dec2bin(x)                   //conversion to
   binary

//Results
printf("Binary of 26 = %s",z1)
```

Scilab code Exa 23.18 Example 18

```
//Chapter 23, Example 23.18

//Conversion of decimal to binary//
clc
//clears the console//
clear
//clears all existing variables//
q=0
b=0
s=0
//initialising//
//a=input(enter the decimal number to be converted
   to its binary form)
//taking input from the user//
a=34.6875
d=modulo(a,1)
//separating the decimal part from the integer//
a=floor(a)
a1=a
a=0
//removing the decimal part//
```

```
while(a>0)
//integer part converted to equivalent binary form//
x=modulo(a,2)
b=b+(10^q)*x
a=a/2
a=floor(a)
q=q+1
end
for i=1: 10
//taking values after the decimal part and converting to equivalent binary form//
d=d*2
q=floor(d)
s=s+q/(10^i)
if d>=1 then
    d=d-1
end
end
l=dec2bin(a1)
k=b+s

disp('the decimal number in binary form is :')
printf("%s . %d",l,k*10**4)
//result is displayed//
```

Scilab code Exa 23.19 Example 19

```
//Chapter 23, Example 23.19

clc
//Initialisation
x="A013"                          //hex number to be convert


```

```
//Calculation
x1=hex2dec(x)                    //conversion to
    decimal

//Results
printf("Decimal of A013 = %d",x1)
```

Scilab code Exa 23.20 `Example 20`

```
//Chapter 23, Example 23.17
clc
//Initialisation
x=7046                 //decimal number to be convert


//Calculation
z1=dec2hex(x)                    //conversion to hex
    number

//Results
printf("Hex of 7046 = %s",z1)
```

Scilab code Exa 23.21 `Example 21`

```
//Chapter 23, Example 23.21
clc
//Initialisation
x="F851"                 //hex number to be convert


//Calculation
z1=hex2dec(x)                    //conversion to
    decimal
```

```
z2=dec2bin(z1)                          //conversion to
    binary

//Results
printf("Binary of F851 = %s",z2)
```

Scilab code Exa 23.22 Example 22

```
//Chapter 23, Example 23.22
clc
//Initialisation
x="111011011000100"                                //binary numbr
     to be convert


//Calculation
z1=bin2dec(x)                          //conversion to
    decimal
z2=dec2hex(z1)                          //conversion to
    binary

//Results
printf("Hex of 111011011000100 = %s",z2)
```

Scilab code Exa 23.23 Example 23

```
//Chapter 23, Example 23.23
clc
//Initialisation
x=[9 4 5 0]                    //decimal number to be
    convert


```

```
//Calculation
//using for loop for converting each decimal to BCD
n=4
m=4
disp("BCD is ")
for i = 1:n
    z=dec2bin(x(i),m)                    //decimal to
        binary conversion
    printf(z)
    printf(" ")                          //display of BCD
end
```

Scilab code Exa 23.24 Example 24

```
//Chapter 23, Example 23.16
clc

a=11100001110110                         //input BCD
    digits
z =0;

d= modulo (a ,10000)
for j =1:3
    y(j)= modulo (d ,10)
    z=z+(y(j) *(2^(j -1)))
    d=d/10
    d= floor (d)
end

b=a /10000
b= floor (b)
c= modulo (b ,10000)
z1 =0
for j =1:3
    y(j)= modulo (c ,10)
```

```
    z1=z1 +(y(j) *(2^(j -1) ))
    c=c/10
    c= floor (c)
end

e=b /10000
e= floor (e)
e1= modulo (e ,10000)
z2 =0
for j =1:4
    y(j)= modulo (e1 ,10)
    z2=z2 +(y(j) *(2^(j -1) ))
    e1=e1/10
    e1= floor (e1)
end

f=e /10000
f= floor (f)
z3 =0
for j =1:2
    y(j)= modulo (f ,10)
    z3=z3 +(y(j) *(2^(j -1) ))
    f=f/10
    f= floor (f)
end


r=z3*1000+z2 *100+ z1 *10+ z
printf ( '(11100001110110)BCD to Decimal = %d ' ,r)          //display of decimal numbers
```

Chapter 26

Implementing Digital Systems

Scilab code Exa 26.1 Example 1

```
//Chapter 26, Example 26.1

clc
//Initialisation
n=24                              //no of bits


//Calculation
ad=2**n                           //no of locations


//Results
printf("No of Locations = %d ",ad)
```

Scilab code Exa 26.4 Example 4

```
//Chapter 26, Example 26.4

```

```
clc
//Initialisation
x=5                    //decimal number to be convert
y=65536                  //2^16 decimal number


//Calculation
z=y-x                              //subtraction from
   2^16 number
z1=dec2bin(z)                      //conversion to
   binary

//Results
printf("-5 as a 16 bit signed number = %s",z1)
```