Scilab Textbook Companion for Electronic Circuits by M. H. Tooley[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.

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Chapter 1

Electrical Fundamentals

Scilab code Exa 1.4 Express angle of 215 degree in radians

```
//Exa:1.4
clc;
clear;
close;
ang_d=215;//given
ang_r=ang_d*%pi/180;
printf("%f degree angle is %f radians",ang_d,ang_r);
```

Scilab code Exa 1.5 Express angle in degrees

```
//Exa:1.5
clc;
clear;
close;
ang_r=2.5;//given
ang_d=2.5*180/%pi;//angle in degrees
printf("%f radians angle is %f degrees",ang_r,ang_d)
    ;
```

Scilab code Exa 1.6 Calculate the current in milliamp

```
//Exa:1.6
clc;
clear;
close;
i_amp=0.075;//given
i_milamp=i_amp*1000;//current in milliamp.
printf("%f amp current is %f mA",i_amp,i_milamp);
```

Scilab code Exa 1.7 Express the freq in Mhz of 1495 kHz radio transmitter

```
//Exa:1.7
clc;
clear;
close;
fq_khz=1495;//given
fq_Mhz=fq_khz/1000;
printf("%f kHz frequency is %f MHz",fq_khz,fq_Mhz);
```

Scilab code Exa 1.8 Express the capacitance in microfarad of 27000 pF

```
//Exa:1.8
clc;
clear;
close;
c_pF=27000;//given
c_uF=c_pF/1000;
printf("%f picofarad capacitance is %f microfarad",
   c_pF,c_uF);
```

Scilab code Exa 1.9 Express current in amp

```
//Exa:1.9
clc;
clear;
close;
c_mA=7.25;//given
c_A=c_mA*1000;
printf("%f milliampere current is %f ampere",c_mA,
   c_A);
```

Scilab code Exa 1.10 Express the voltage in millivolt using exp notation

```
//Exa:1.10
clc;
clear;
close;
vg_v=3.75*10^-6;//given
vg_mv=vg_v*1000;
printf("%f volt voltage is %e mV",vg_v,vg_mv);
```

Scilab code Exa 1.11 Calculate the voltage dropped across 33kohm with 3mA current

```
//Ex:1.11
clc;
clear;
close;
r=33000;//in ohms
```

```
i=0.003;//in amp
v=i*r;
printf("Voltage dropped = %d volts",v);
```

Scilab code Exa 1.12 Calculate the charge transferred in 20ms by 45 microamp current

```
//Ex:1.12
clc;
clear;
close;
t=20*10^-3;//in sec
i=45*10^-6;//in amp
q=i*t*10^9;
printf("Charge transferred = %f nC",q);
```

Scilab code Exa 1.13 Calculate the current supplied to the circuit when 1500V is applied dissipating 300 mW

```
//Ex:1.13
clc;
clear;
close;
p=0.3;//in watts
v=1500;//in volts
i=(p/v)*10^6;
printf("Current supplied = %d microamp",i);
```

Scilab code Exa 1.14 Calculate the current through resistor 12ohm with 6V battery

```
//Ex:1.14
clc;
clear;
close;
r=12;//in ohms
v=6;//in volts
i=(v/r);
printf("Current = %f Amp",i);
```

Scilab code Exa 1.15 Calculate the voltage developed across 56ohm with 100mA current

```
//Ex:1.15
clc;
clear;
close;
r=56;//in ohms
i=0.1;//in amp
v=i*r;
printf("Voltage dropped = %f volts",v);
```

Scilab code Exa 1.16 Calculate the resistance with 15 volt applied with 1mA current

```
//Ex:1.16
clc;
clear;
close;
v=15;//in volts
i=0.001;//in amp
r=v/i;
printf("Resistance = %d ohms",r);
```

Scilab code Exa 1.17 Calculate the resistance of 8m length cooper wire

```
//Ex:1.17
clc;
clear;
close;
p=1.724*10^-8;//in ohm-meter
l=8;//in meters
a=1*10^-6;//in sq. meter
r=(p*l)/a;
printf("Resistance = %f ohms",r);
```

Scilab code Exa 1.18 Calculate the voltage drop between the ends of the 20m wire carring 5A current

```
//Ex:1.18
clc;
clear;
close;
p=1.724*10^-8;//in ohm-meter
l=20;//in meters
a=1*10^-6;//in sq. meter
i=5;//in amperes
r=(p*l)/a;
v=i*r;
printf("Voltage dropped = %f volts",v);
```

Scilab code Exa 1.19 Calculate the power supplied by 3 V battery

```
//Ex:1.19
clc;
clear;
close;
v=3;//in volts
i=1.5;//in amperes
p=v*i;
printf("Power supplied = %f watts",p);
```

Scilab code Exa 1.20 Calculate the power dissipated in 100ohm with 4V drop

```
//Ex:1.20
clc;
clear;
close;
v=4;//in volts
r=100;//in ohms
p=(v^2)/r;
printf("Power dissipated = %f watts",p);
```

Scilab code Exa 1.21 Calculate the power dissipated in 100ohm with 4V drop

```
//Ex:1.21
clc;
clear;
close;
i=20*10^-3;//in amps
r=1000;//in ohms
p=(i^2)*r;
printf("Power dissipated = %f watts",p);
```

Scilab code Exa 1.22 Calculate the electric field strength if 2 parallel plates seperated by 25mm are fed by 600V supply

```
//Ex:1.22
clc;
clear;
close;
v=600;//in volts
d=25*10^-3;//in meters
E=(v)/d;
printf("Electric Field Strength = %d kV/m",E/1000);
```

Scilab code Exa 1.23 Calculate the flux density at 50mm from st wire carrying 20A

```
//Ex:1.23
clc;
clear;
close;
u=4*%pi*10^-7;//in H/m
i=20;//in amps
d=50*10^-3;//in meters
B=(u*i)/(2*%pi*d);
printf("Flux Density = %e Tesla",B);
```

Scilab code Exa 1.24 Calculate the total flux by flux density

```
//Ex:1.24
clc;
```

```
clear;
close;
B=(2.5*10^-3);//in Tesla
a=(20*10^-4);//in sq. meter
flux=B*a;
printf("Flux = %e webers",flux);
```

Scilab code Exa 1.25 Calculate the relative permitivity of steel at different given flux density

```
//Ex:1.25
clc;
clear;
close;
B1=0.6;//in Tesla
u1=B1/800;
u_r1=u1/(4*%pi*10^-7);
printf("reltive permitivity at 0.6T = %f",u_r1);
B2=1.6;//in Tesla
u2=0.2/4000;
u_r2=u2 /(4*%pi*10^-7);
printf("\n reltive permitivity at 1.6T = %f",u_r2);
```

Scilab code Exa 1.26 Calculate the current to establish given flux

```
//Ex:1.26
clc;
clear;
close;
flux=0.8*10^-3;
a=(500*10^-6);//in sq. meter
l=0.6;//in meter
N=800;
```

```
B=flux/a;
printf("Flux Density = %e Tesla",B);
H=3500;//in A/m
i=(H*l)/N;
printf("\n Current required = %f amp.s",i);
```

Chapter 2

Passive Components

Scilab code Exa 2.1 Determine the tolerance of resistor

```
//Ex:2.1
clc;
clear;
close;
marked=220;//in ohms
measured=207;//in ohms
err=marked-measured;
tol=(err/marked)*100;
printf("Tolerance = %f %%",tol);
```

Scilab code Exa 2.2 Nominal current taken from supply and Max and Min value of supply current

```
//Ex:2.2
clc;
clear;
close;
r=39;//in ohms
```

```
v=9;//in volts
i=(v/r);//in Amps
printf("Current = %d mA",i*1000);
tol=0.1;//i.e, 10%
r_min=r-(tol*r);
i_max=v/r_min;
r_max=r+(tol*r);
i_min=v/r_max;
printf("\n Max.Current = %f mA & Min Current= %f mA"
    ,i_max*1000,i_min*1000);
```

Scilab code Exa 2.3 Determine value and type of resistor used for 100mA

```
//Ex:2.3
clc;
clear;
close;
v=28;//in volts
i=0.1;//in A
r=v/i;
p=v*i;
printf("Resistance Value = %f ohms & Power
    dissipated = %f W",r,p);
```

Scilab code Exa 2.4 Determine the value and tolerance of resistor of brown black red silver

```
//Ex:2.4
clc;
clear;
close;
r=10*(10^2);
printf("Resistor value = %d ohm",r);
```

```
printf("\nTolerance = 10 %%");
```

Scilab code Exa 2.5 Determine the value and tolerance of resistor of red violet orange gold

```
//Ex:2.5
clc;
clear;
close;
r=27*(10^3);
printf("Resistor value = %d ohm",r);
printf("\nTolerance = 5 %%");
```

Scilab code Exa 2.6 Determine the value and tolerance of resistor of green blue black gold

```
//Ex:2.6
clc;
clear;
close;
r=56*(10^0);
printf("Resistor value = %d ohm",r);
printf("\nTolerance = 5 %%");
```

Scilab code Exa 2.7 Determine the value and tolerance of resistor of red green black brown

```
//Ex:2.7
clc;
clear;
```

```
close;
r=25*(10^0);
printf("Resistor value = %d ohm",r);
printf("\nTolerance = 20 %%");
```

Scilab code Exa 2.8 Determine the bands coressponding to 2pt kohm of tolerance 2 percent

```
//Ex:2.8
clc;
clear;
close;
r=22*(10^3);
printf("Bands are Red, Red, Red, Red");
```

Scilab code Exa 2.9 Determine the bands coressponding to 4R7K

```
//Ex:2.9
clc;
clear;
close;
printf("Resistance = 4.7 ohm with 10%% tolerance");
```

Scilab code Exa 2.10 Determine the bands coressponding to 330RG

```
//Ex:2.10
clc;
clear;
close;
printf("Resistance = 330 ohms with 2%% tolerance");
```

Scilab code Exa 2.11 Determine the bands coressponding to R22M

```
//Ex:2.11
clc;
clear;
close;
printf("Resistance = 0.22 ohm with 20%% tolerance");
```

Scilab code Exa 2.12 Determine the effective resistance in Series and Parallel

```
//Ex:2.12
clc;
clear;
close;
r1=22;//in ohms
r2=47;//in ohms
r3=33;//in ohms
r_ser=r1+r2+r3;
printf("Effective resistance in series = %d ohms",
   r_ser);
r_parel=((1/r1)+(1/r2)+(1/r3))^-1;
printf("\n Effective resistance in parallel = %f
   ohms",r_parel);
```

Scilab code Exa 2.13 Determine the effective resistance of the circuit

```
//Ex:2.13
clc;
```

```
clear;
close;
r1=4.7;//in ohms
r2=47;//in ohms
r3=12;//in ohms
r4=27;//in ohms
r5=r3+r4;
r_parel=((1/r5)+(1/r2))^-1;
r_eff=r_parel+r1;
printf("Effective resistance = %d ohms",r_eff);
```

Scilab code Exa 2.14 Determine the resistance required to realize 50 ohm at 2W

```
//Ex:2.14
clc;
clear;
close;
printf("Two 100 ohm resistor of 1 W");
```

Scilab code Exa 2.15 Determine the resistance at 80 degree

```
//Ex:2.15
clc;
clear;
close;
temp_coeff=0.001;//in per degree centigrade
r_o=1500;//in ohm
t=80;//temperature diff.
r_t=r_o*(1+(temp_coeff)*t)
printf("Resistance at %d degree = %d ohms",t,r_t);
```

Scilab code Exa 2.16 Determine the resistance at 90 degree

```
//Ex:2.16
clc;
clear;
close;
temp_coeff=0.0005;//in per degree centigrade
r_t1=680;//in ohm
t1=20;//temperature diff.
t2=90;
r_o=r_t1/(1+(temp_coeff)*t1);
r_t2=r_o*(1+(temp_coeff)*t2);
printf("Resistance at %d degree = %f ohms",t2,r_t2);
```

Scilab code Exa 2.17 Determine the resistor temperature coeff

```
//Ex:2.17
clc;
clear;
close;
r_o=40;//resis at 0 degree
r_t=44;//at 100 degree
t=100;//temperature diff.
temp_coeff=(1/t)*((r_t/r_o)-1);
printf("Temperature Coefficient = %f per degree
    centigrade",temp_coeff);
```

Scilab code Exa 2.18 Determine the current flow

```
//Ex:2.18
clc;
clear;
close;
V_1=50;
V_2=10;
dV=V_1-V_2;//in volts
dt=0.1;//in seconds
C=22*10^-6;
i=C*(dV/dt)*1000;//in mA
printf("Current flow = %f milliAmps",i);
```

Scilab code Exa 2.19 Determine the charged stored

```
//Ex:2.19
clc;
clear;
close;
C=10*10^-6;
V=250;//in volts
Q=V*C*1000;//in millicoulomb
printf("Charged stored =%f mC",Q);
```

Scilab code Exa 2.20 Determine the potential diff that be applied to 47 uFcapacitor

```
//Ex:2.20
clc;
clear;
close;
C=47*10^-6;//in farads
W=4;//energy in joules
V=sqrt(W/(0.5*C));
```

```
printf("Voltage tht be applied = %d volts",V);
```

Scilab code Exa 2.21 Determine the required plate area for 1 nF capacitor

```
//Ex:2.21
clc;
clear;
close;
E_o=8.85*10^-12;
E_r=5.4;
C=1*10^-9;
d=0.1*10^-3;
A=(C*d)/(E_o*E_r)*10^4;
printf("Required plate area = %f sq. cm",A);
```

Scilab code Exa 2.22 Determine the value of capacitance

```
//Ex:2.22
clc;
clear;
close;
E_o=8.85*10^-12;
E_r=4.5;
n=6;//no. of plates
d=0.2*10^-3;//in meter
A=20*10^-4;//in sq.meter
C={(E_o*E_r*(n-1)*A)/d}*10^11;
printf("Capacitance = %d pF",C);
```

Scilab code Exa 2.23 Determine the value of capacitor 103K

```
//Ex:2.23
clc;
clear;
close;
printf("Capacitance = 10000 pF of 10%%");
```

Scilab code Exa 2.24 Determine the value of tubular capacitor with brown green brown red brown

```
//Ex:2.24
clc;
clear;
close;
printf("Capacitance = 150 pF of 2%% tolerance at 100
    V");
```

Scilab code Exa 2.25 Determine the effective capacitance

```
//Ex:2.25
clc;
clear;
close;
C1=2;//in nF
C2=4;//in nF
C3=2;
C4=4;
C_a=C1+C2;
C_b=C_a*C3/(C_a+C3);
C_eff=C4+C_b;
printf("Capacitance = %f nF",C_eff);
```

Scilab code Exa 2.26 Determine the series combination of capacitos and their voltage rating

```
//Ex:2.26
clc;
clear;
close;
C=100;//in uF
C_eff=C*C/(C+C);
printf("Two capacitors of %d uF be in parallel used
    to make %d uF capacitance",C,C_eff);
```

Scilab code Exa 2.27 Determine the voltage induced

```
//Ex:2.27
clc;
clear;
close;
L=600*10^-3;//in H
I1=6;//in A
I2=2;//in A
dI=I1-I2;
dt=250*10^-3;//in sec.
E=-L*(dI/dt);
printf("Induced voltage = %f volts",E);
```

Scilab code Exa 2.28 Determine the current that be applied to an inductor

```
//Ex:2.28
clc;
clear;
close;
```

```
E=2.5;//energy in joules
L=20*10^-3;//in henry
I=sqrt(E/(0.5*L));
printf("Current = %f A",I);
```

Scilab code Exa 2.29 Determine the numbers of turns required

```
//Ex:2.29
clc;
clear;
close;
u_o=12.57*10^-7;
u_r=500;
A=15*10^-4;//area of cross-section in sq. meters
l=20*10^-2;//length
L=100*10^-3;//in henry
n=sqrt((L*l)/(u_r*u_o*A));
printf("Inductor requires %d turns of wire",n);
```

Scilab code Exa 2.30 Determine the parallel combination for 5mH inductor rated at 2A

```
//Ex:2.30
clc;
clear;
close;
//L=(L1*L2)/(L1+L2)
L_eq=5;//in millihenry
printf("Inductor of 10 mH wired in parallel would
   provide %d mH",L_eq);
```

Scilab code Exa 2.31 Determine the effective inductance

```
//Ex:2.31
clc;
clear;
close;
L1=60;//in mH
L2=60;//in mH
L_a=L1+L2;
L3=120;//in mH
L_b=L_a*L3/(L_a+L3);
L4=50;//in mH
L_eq=L4+L_b;
printf("Equivalent Inductance = %d mH",L_eq);
```

Chapter 3

DC Circuits

Scilab code Exa 3.1 Determine the value of current flowing between A B and value of I3

```
//Ex:3.1
clc;
clear;
close;
i1=1.5;
i2=2.7;//in amp.s
i5=i1+i2;
i4=3.3;
i3=i4+i5;
printf("Current b/w A & B = %f A",i5);
printf("\n Current I3 = %f A",i3);
```

Scilab code Exa 3.2 Determine the value of V2 and value of E3

```
//Ex:3.2
clc;
clear;
```

```
close;
E1=6;
E2=3;
V2=E1-E2;
V1=4.5;
E3=V1-E2;
printf("Value of V2 = %f A",V2);
printf("\n Value of E3 = %f A",E3);
```

Scilab code Exa 3.3 Determine the voltage and current in circuit

```
//Ex:3.3
clc;
clear;
close;
V1=7.5;//in volts
V2=4.5;
V3=4.5;
r1=110;//in ohms
r2=33;
r3=22;
i1=V1/r1;
i2=V2/r2;
i3=V3/r3;
printf("Current I1 = %f A",i1);
printf("\n Current I2 = %f A",i2);
printf("\n Current I3 = %f A",i3);
```

Scilab code Exa 3.4 Determine the output when no load and loaded by 10kohm

```
//Ex:3.4
clc;
```

```
clear;
close;
V_in=5;//in volts
r1=4000;
r2=1000;
r_p=r1*r2/(r1+r2);
V_out=V_in*(r2/(r1+r2));
V_out_p=V_in*(r_p/(r_p+r2));
printf("output voltage at no load = %f A",V_out);
printf("\n output voltage when loaded by 10kohms =
    %f A",V_out_p);
```

Scilab code Exa 3.5 Determine the value of parallel shunt resistor

```
//Ex:3.5
clc;
clear;
close;
I_in=5;//in mA
R_m=100;
I_m=1;
R_s=R_m*I_m/(I_in-1);
printf("Value of parallel shunt resistor = %d A",R_s
    );
```

Scilab code Exa 3.6 Determine the range of resistances that can be measured

```
//Ex:3.6
clc;
clear;
close;
r1=100;
```

```
r2=1000;
R_x_1=(r2/r1)*10000;
R_x_2=(r1/r2)*10;
printf("Range extends from %d ohms to %d ohms",R_x_2
    ,R_x_1);
```

Scilab code Exa 3.7 Determine the current flow in 100 ohm load

```
//Ex:3.7
clc;
clear;
close;
E=10;
r1=500;
r2=600;
r3=500;
r4=400;
V_a=E*(r2/(r1+r2));
V_b=E*(r4/(r3+r4));
V_oc=V_a-V_b;
r=((r1*r2)/(r1+r2))+((r3*r4)/(r3+r4));
i=(V_oc/(r+100))*1000;
printf("Current flow in 100 ohm resistor = %f mA",i
    );
```

Scilab code Exa 3.8 Determine the voltage produced

```
//Ex:3.8
clc;
clear;
close;
I_sc=19;//in uA
R=1000;
```

```
R_m=968;
V_out=I_sc*(R*R_m/(R+R_m));
printf("Voltage produced = %d uV",V_out);
```

Scilab code Exa 3.9 Determine the voltage produced

```
//Ex:3.9
clc;
clear;
close;
c=1*10^-6;//in farads
r=3.3*10^6;//in ohms
t=1;//in sec.
V_s=9;//in volts
V_c=V_s*(1-%e^(-t/(r*c)));
printf("Voltage produced = %f V",V_c);
```

Scilab code Exa 3.10 Determine the initial charging current and current that flow 50ms and 100ms after connecting supply After what time does capacitor fully charge

```
//Ex:3.10
clc;
clear;
close;
c=100*10^-6;//in farads
r=1*10^3;//in ohms
t1=50*10^-3;//in sec.
t2=100*10^-3;//in sec.
V_s=350;//in volts
i1=(V_s/1000)*(%e^(-t1/(r*c)));
i2=(V_s/1000)*(%e^(-t2/(r*c)));
```

```
printf("Charging current after %f sec = %f A",t1,i1)
    ;
printf("\n Charging current after %f sec = %f A",t2,
    i2);
```

Scilab code Exa 3.11 Determine the time taken by the capacitor to fall below 10V

```
//Ex:3.11
clc;
clear;
close;
c=10*10^-6;//in farads
r=47*10^3;//in ohms
V_s=20;//in volts
V_c=10;
t=-c*r*log(V_c/V_s);
printf("time taken = %f sec.",t);
```

Scilab code Exa 3.12 Determine the capacitor voltage 1 minute later

```
//Ex:3.12
clc;
clear;
close;
c=150*10^-6;//in farads
r=2*10^6;//in ohms
V_s=150;//in volts
V_c=0.8187*V_s;
printf("Capacitor voltage = %f V",V_c);
```

Scilab code Exa 3.13 Determine the C R values for sq wave of 1kHz

```
//Ex:3.13
clc;
clear;
close;
r=10*10^3;//in ohms
t=1*10^-3;
c=(0.1*t/r)*10^9;
printf("Capacitor = %d nF",c);
```

Scilab code Exa 3.14 Determine the C R values for sq wave of 1kHz

```
//Ex:3.14
clc;
clear;
close;
r=10*10^3;//in ohms
t=1*10^-3;
c=(10*t/r)*10^6;
printf("Capacitor = %d uF",c);
```

Scilab code Exa 3.15 Determine the current in the inductor after supply first connected

```
//Ex:3.15
clc;
clear;
close;
L=6;//in henry
r=24;//in ohms
t=0.1;//in sec.
V_s=12;//in volts
```

```
i=(V_s/r)*(1-%e^(-t*r/L));
printf("current = %f A",i);
```

Scilab code Exa 3.16 Determine the inductor voltage 20ms after supply first connected

```
//Ex:3.16
clc;
clear;
close;
V_s=5;//in volts
V_c=0.8647*V_s;
printf("Inductor voltage = %f V",V_c);
```

Chapter 4

Alternating voltage and current

Scilab code Exa 4.1 Determine the instanteous voltage

```
//Ex:4.1
clc;
clear;
close;
V_m=20;//in volts
f=50;//in Hz
t1=2.5*10^-3;
t2=15*10^-3;
V1=V_m*sin(2*%pi*f*t1);
V2=V_m*sin(2*%pi*f*t2);
printf("Voltage at 2.5ms = %f V",V1);
printf("\n Voltage at 15ms = %f V",V2);
```

Scilab code Exa 4.2 Determine the time period of 400 Hz waveform

```
//Ex:4.2
clc;
clear;
```

```
close;
f=400;//in Hz
T=1/f;
printf("Time period of %d Hz waveform = %f sec",f,T);
```

Scilab code Exa 4.3 Determine the freq of 40 ms waveform

```
//Ex:4.3
clc;
clear;
close;
T=40*10^-3;//in Hz
f=1/T;
printf("Frequency of 40 ms waveform = %f Hz",f);
```

Scilab code Exa 4.4 Determine the peak value of 240V rms

```
//Ex:4.4
clc;
clear;
close;
V_rms=240;//in Volts
V_pk=1.414*V_rms;
printf("Peak voltage of %d V RMS voltage = %f V",V_rms,V_pk);
```

Scilab code Exa 4.5 Determine the rms value of 50mA peak to peak

```
//Ex:4.5
```

```
clc;
clear;
close;
I_pk=50*10^-3;//in Amps
I_rms=0.353*I_pk;
printf("RMS current of 50mA peak current = %f A",
    I_rms);
```

Scilab code Exa 4.6 Determine the rms current

```
//Ex:4.6
clc;
clear;
close;
V=10;//pk-pk voltage
r=1000;//ohms
I_pk=V/r;//in Amps
I_rms=0.353*I_pk*1000;//milliamps
printf("RMS current of 10V peak-peak voltage = %f mA
    ",I_rms);
```

Scilab code Exa 4.7 Determine the reactance of 1uF at 100Hz and 10kHz

```
//Ex:4.7
clc;
clear;
close;
c=1*10^-6;
f1=100;
f2=10000;
X_c1=1/(2*%pi*f1*c);
X_c2=1/(2*%pi*f2*c);
printf("Reactance at 100Hz = %f mA",X_c1);
```

```
printf("\n Reactance at 10kHz = %f mA",X_c2);
```

Scilab code Exa 4.8 Determine the current flow in capacitor

```
//Ex:4.8
clc;
clear;
close;
V=240;
c=100*10^-9;
f=50;
X_c=1/(2*%pi*f*c);
I_c=V/X_c;
printf("Current flow = %f A",I_c);
```

Scilab code Exa 4.9 Determine the reactance of 1mH at 100Hz and 10kHz

```
//Ex:4.9
clc;
clear;
close;
L=1*10^-3;
f1=100;
f2=10000;
X_L1=(2*%pi*f1*L);
X_L2=(2*%pi*f2*L);
printf("Reactance at 100Hz = %f ohm",X_L1);
printf("\nReactance at 10kHz = %f ohm",X_L2);
```

Scilab code Exa 4.10 Determine the reactance of 1mH at 100Hz and 10kHz

```
//Ex:4.10
clc;
clear;
close;
L=1*10^-3;
f1=100;
f2=10000;
X_L1=(2*%pi*f1*L);
X_L2=(2*%pi*f2*L);
printf("Reactance at 100Hz = %f ohm",X_L1);
printf("\nReactance at 10kHz = %f ohm",X_L2);
```

Scilab code Exa 4.11 Determine the impedance of the circuit and current fro supply

```
//Ex:4.11
clc;
clear;
close;
C=2*10^-6;
f=400;
V=115;
X_C=1/(2*%pi*f*C);
r=199;
z=sqrt(r^2+X_C^2);
I_s=V/z;
printf("Reactance = %f ohm",X_C);
printf("\n Current = %f A",I_s);
```

Scilab code Exa 4.12 Determine the power factor of choke and currentt from supply

```
//Ex:4.12
```

```
clc;
clear;
close;
L=150*10^-3;
f=400;
V=115;
X_L=(2*%pi*f*L);
r=250;
z=sqrt(r^2+X_L^2);
I_s=V/z;
printf("Reactance = %f ohm",X_L);
printf("\n Current = %f A",I_s)
```

Scilab code Exa 4.13 Determine the value of capacitance required

```
//Ex:4.13
clc;
clear;
close;
L=100*10^-3;
f=400;
C=(1/(4*%pi*%pi*f*f*L))*10^6;
printf("Capacitance required = %f uF",C);
```

Scilab code Exa 4.14 Determine the current supplied and voltage developed across 100 ohm

```
//Ex:4.14
clc;
clear;
close;
L=20*10^-3;
f=2000;
```

```
V=1.5;
r=100;
C=10*10^-9;
X_L=(2*%pi*f*L);
X_C=1/(2*%pi*f*C);
z=sqrt(r^2+(X_L-X_C)^2);
i=V/z;
v=i*r;
printf("Current supplied = %f mA",i);
printf("\nVoltage developed = %f V",v);
```

Scilab code Exa 4.15 Determine the value of secondry voltage

```
//Ex:4.15
clc;
clear;
close;
N_s=120;
V_p=220;
N_p=2000;
V_s=N_s*V_p/N_p;
printf("Secondry voltage = %f V",V_s);
```

Scilab code Exa 4.16 Determine the number of secondary turns and primary current

```
//Ex:4.16
clc;
clear;
close;
V_p=200;
V_s=10;
N_p=1200;
```

```
N_s=N_p*V_s/V_p;
i_s=2.5;
i_p=N_s*i_s/N_p;
printf("Secondry turns = %d ",N_s);
printf("\nprimary current = %f A",i_p);
```

Chapter 5

Semiconductors

Scilab code Exa 5.1 Determine the resistance of diode when forward current is given and when forward voltage is given

```
//Ex:5.1
clc;
clear;
close;
v1=0.43;//volts
i1=2.5*10^-3;//in Amps.
v2=0.65;//volts
i2=7.4*10^-3;//in Amps.
r1=v1/i1;
r2=v2/i2;
printf("Diode resistance for 2.5A current = %d ohms"
    ,r1);
printf("\n Diode resistance for 0.65V = %f ohms",r2)
    ;
```

Scilab code Exa 5.2 Determine the series resistor required

```
//Ex:5.2
clc;
clear;
close;
i=15*10^-3;
R=(21-2.2)/i;
v=18.8;//in volts
P=i*v*1000;
printf("Resistor %d ohms of %d mW",R,P);
```

Scilab code Exa 5.3 Determine the Ie emitter current and hfe

```
//Ex:5.3
clc;
clear;
close;
I_c=30;//in mA
I_b=0.6;
I_e=I_c+I_b;
hfe=I_c/I_b;
printf("Emitter current = %f ohms      &      hfe = %d",
   I_e,hfe);
```

Scilab code Exa 5.4 Determine the Ie emitter current and hfe

```
//Ex:5.4
clc;
clear;
close;
I_c=30;//in mA
I_b=0.6;
I_e=I_c+I_b;
hfe=I_c/I_b;
```

```
printf("Emitter current = %f ohms    &    hfe = %d",
    I_e,hfe);
```

Scilab code Exa 5.5 Determine the Ib base current and hfe

```
//Ex:5.5
clc;
clear;
close;
I_e=98;//in mA
I_c=97;
I_b=I_e-I_c;
hfe=I_c/I_b;
printf("Emitter current = %d mA    &    hfe = %d",
    I_b,hfe);
```

Scilab code Exa 5.6 Determine the hfe required and collector power dissipation

```
//Ex:5.6
clc;
clear;
close;
I_c=1.5;//in A
I_b=50*10^-3;
V_ce=6;//volts
hfe=I_c/I_b;
P=I_c*V_ce;
printf("hfe required = %d",hfe);
printf("\n collector power dissipation = %d W",P);
```

Scilab code Exa 5.7 Determine the I base current and change in collector current

```
//Ex:5.7
clc;
clear;
close;
hfe=200
I_c=10*10^-3;
dI_b=I_c/hfe;
dI_c=hfe*dI_b/100;
printf("Base current = %f A ",dI_b);
printf("\nChange in collector current = %f mA",dI_c)
    ;
```

Scilab code Exa 5.8 Determine the change in drain current

```
//Ex:5.8
clc;
clear;
close;
dV_gs=0.025;
g_fs=-0.5;
dI_d=dV_gs*g_fs;//in mA
I_d1=50*10^-3;//in mA
I_d2=dI_d+I_d1;
printf("Change in drain current = %f A",dI_d);
printf("\nNew value of drain current = %f A",I_d2);
```

Chapter 6

Power Supplies

Scilab code Exa 6.1 Determine the peak voltage that appear across load

```
//Ex:6.1
clc;
clear;
close;
V_p=220;
V_s=V_p/44;
V_pk=1.414*V_s;//in volts
V_l=V_pk-0.6;
printf("Peak voltage that appear across load = %f V"
   ,V_l);
```

Scilab code Exa 6.2 Determine the amt of ripple at output

```
//Ex:6.2
clc;
clear;
close;
X_c=3.18;
```

```
R=100;
V_rip=1*(X_c/sqrt(R^2+X_c^2));
printf("Ripple voltage = %f V",V_rip);
```

Scilab code Exa 6.3 Determine the amt of ripple at output

```
//Ex:6.3
clc;
clear;
close;
f=50;
L=10;
X_l=2*%pi*f*L;
X_c=3.18;
V_rip=1*(X_c/sqrt(X_l^2+X_c^2));
printf("Ripple voltage = %f V",V_rip);
```

Scilab code Exa 6.4 Determine the series resistor for operation in conjunction with 9V

```
//Ex:6.4
clc;
clear;
close;
R_l=400;
V_in=9;
V_z=5;
P_z_max=0.5;
R_s_max=R_l*((V_in/V_z)-1);
R_s_min=((V_z*V_in)-V_z^2)/P_z_max;
printf("Suitable value of resistor = %d ohm",(
    R_s_max+R_s_min)/2);
```

Scilab code Exa 6.5 Determine equiv output resistance and regulation of power supply

```
//Ex:6.5
clc;
clear;
close;
dI_i=20;
dV_o=0.5;
dV_o_reg=0.1;
dI_o=2;
R_out=dV_o/dI_o;
Regulation=(dV_o_reg/dI_i)*100;
printf(" output resis. = %f ohm",R_out);
printf(" \n regulation. = %f %%",Regulation);
```

Chapter 7

Amplifiers

Scilab code Exa 7.1 Determine voltage gain and current gain and power gain

```
//Ex:7.1
clc;
clear;
close;
I_i=4;
V_o=2;
V_i=50*10^-3;
I_o=200;
A_v=V_o/V_i;
A_i=I_o/I_i;
printf(" Volt gain = %f ",A_v);
printf("\n Current gain = %f ",A_i);
printf("\n Power gain = %f ",A_i*A_v);
```

Scilab code Exa 7.2 Determine voltage gain and upper and lower cutoff freq

```
//Ex:7.2
clc;
clear;
close;
A_v_max=35;
A_v_cutoff=0.707*A_v_max;
printf(" Mid-band Volt gain = %f ",A_v_cutoff);
printf("\n upper freq = 590Hz & lower freq = 57Hz");
```

Scilab code Exa 7.3 Determine overall voltage gain with negative feedback

```
//Ex:7.3
clc;
clear;
close;
A=50;
b=0.1;
G=A/(1+b*A);
printf(" overall Volt gain = %f ",G);
```

Scilab code Exa 7.4 Determine percentage increase in overall voltage gain

```
//Ex:7.4
clc;
clear;
close;
A=50;
A_new=A+0.2*A;
b=0.1;
G=A_new/(1+b*A_new);
dG=8.33-G/8.33;
```

```
printf(" percentage change in overall volt gain = %f
    %%",dG);
```

Scilab code Exa 7.5 Determine amount of feedback required

```
//Ex:7.5
clc;
clear;
close;
A=100;
G=20;
b=(1/G)-(1/A);
printf("amount of feedback required = %f ",b);
```

Scilab code Exa 7.6 Determine output voltage produced by input signal of 10mV

```
//Ex:7.6
clc;
clear;
close;
h_oe=80*10^-6;
R_l=10000;
I_f=320*10^-6;
I_c=I_f*(1/h_oe)/((1/h_oe)+R_l);
V_out=I_c*R_l;
printf("Output voltage = %f V",V_out);
```

Scilab code Exa 7.7 Determine of load resistance required

```
//Ex:7.7
clc;
clear;
close;
b=200;
h_ie=1.5*10^3;//in ohms
h_fe=150;
R_l=b*h_ie/h_fe;
printf("Load resistance = %d ohms",R_l);
```

Scilab code Exa 7.8 Determine static value of current gain and voltage gain

```
//Ex:7.8
clc;
clear;
close;
V=9;
V_e=2;
R4=1000;
V_b=2.6;
R2=33*10^3;
R1=68000;
I_r1=(V-V_b)/R1;
R3=2.2*10^3;
I_b=15.1*10^-6;
I_c=2.0151*10^-3;
V_r3=I_c*R3;
V_c=V-V_r3;
printf("Collector voltage = %f V",V_c);
```

Scilab code Exa 7.9 Determine quiescent value of collector current and voltage and peak to peak output voltage

```
//Ex:7.9
clc;
clear;
close;
V_pp=14.8-3.3;
printf("Collector quiescent voltage = 9.2 V");
printf("\nCollector quiescent current = 7.3mA");
printf("\nOutput peak-peak voltage = %f V",V_pp);
```

Chapter 8

Operational Amplifiers

Scilab code Exa 8.1 Determine the value of open loop voltage gain

```
//Ex:8.1
clc;
clear;
close;
V_out=2;
V_in=400*10^-6;
A_v=V_out/V_in;
A_v_dB=ceil (20*(log (A_v)/log (10)));
printf("open loop voltage gain = %d dB",A_v_dB);
```

Scilab code Exa 8.2 Determine the value of input current

```
//Ex:8.2
clc;
clear;
close;
V_in=5*10^-3;
R_in=2*10^6;
```

```
I_in=V_in/R_in;
printf("Input current = %e A",I_in);
```

Scilab code Exa 8.3 Determine the slew rate of device

```
//Ex:8.3
clc;
clear;
close;
V_out=10;
t=4;
SR=V_out/t;
printf("Slew rate = %f V/us",SR);
```

Scilab code Exa 8.4 Determine the time taken to change level

```
//Ex:8.4
clc;
clear;
close;
V_out=2;
SR=15;//in V/us
t=V_out/SR;
printf("Time taken = %f us",t);
```

Scilab code Exa 8.6 Determine the circuit parameters using opamps

```
//Ex:8.6
clc;
clear;
```

```
close;
R_in=10000;
f1=250;
f2=15000;
C_in=0.159/(f1*R_in);
C_f=0.159/(f2*R_in);
printf("C_f = %e F",C_f);
```

Chapter 9

Oscillators

Scilab code Exa 9.1 Determine the freq of oscillation

```
//Ex:9.1
clc;
clear;
close;
C=10*10^-9;
R=10000;
f=(1/(2*%pi*sqrt (6)*C*R));
printf("The freq of oscillation = %f Hz",f);
```

Scilab code Exa 9.2 Determine the output freq

```
//Ex:9.2
clc;
clear;
close;
r1=1000;
r2=1000;
c=100*10^-9;
```

```
f=(1/(2*%pi*c*r1));
printf("The freq of oscillation at 1 kohm= %f Hz",f)
    ;
R1=6000;
R2=6000;
F=(1/(2*%pi*c*R1));
printf("\nThe freq of oscillation at 6 kohm= %f Hz",
    F);
```

Scilab code Exa 9.3 Determine the value of R3 and R4

```
//Ex:9.3
clc;
clear;
close;
f=1000;
t=1/f;
C=10*10^-9;
R=t/(1.4*C);
printf("R= %d kohm",R/1000);
```

Chapter 12

The 555 timer

Scilab code Exa 12.1 Determine the parameters of timer circuit

```
//Ex:12.1
clc;
clear;
close;
C=100*10^-9;
t_on=10*10^-3;
R=(t_on/(1.1*C))/1000;
printf("R= %f kohm",R);
```

Scilab code Exa 12.2 Determine the parameters of timer circuit that produce 5V

```
//Ex:12.2
clc;
clear;
close;
C=100*10^-6;
t_on=60;
```

```
R=(t_on/(1.1*C))/1000;
printf("R= %f kohm",R);
```

Scilab code Exa 12.3 Design of pulse generator

```
//Ex:12.3
clc;
clear;
close;
//R1=R2=R
prf=10;
C=1*10^-6;
R=0.48/(prf*C);
printf("R= %d ohm",R);
```

Scilab code Exa 12.4 Design of 5V square wave generator

```
//Ex:12.4
clc;
clear;
close;
prf=50;
C=100*10^-9;
R=0.72/(prf*C);//in ohms
printf("R= %d kohm",R/1000);
```

Chapter 13

Radio

Scilab code Exa 13.1 Determine the frequency of radio signal of wavelength 15m

```
//Ex:13.1
clc;
clear;
close;
c=3*10^8;
wl=15;
f=c/wl;
printf("The frequency =%d Hz",f);
```

Scilab code Exa 13.2 Determine the frequency of radio signal of 150MHz

```
//Ex:13.2
clc;
clear;
close;
c=3*10^8;
f=150*10^6;
```

```
wl=c/f;
printf("The wavelength =%d m",wl);
```

Scilab code Exa 13.3 Determine the velocity of propagation of radio signal of 30MHz and 8m wavelength

```
//Ex:13.3
clc;
clear;
close;
wl=8;
f=30*10^6;
v=f*wl;
printf("The veocity of propagation =%d m/s",v);
```

Scilab code Exa 13.4 Determine the two possible BFO freq

```
//Ex:13.4
clc;
clear;
close;
f_rf=162.5;//in kHz
f_af=1.25;//in kHz
f_bfo_max=f_rf+f_af;
f_bfo_min=f_rf-f_af;
printf("The two possible BFO freq. =%f kHz and %f
    kHz",f_bfo_max,f_bfo_min);
```

Scilab code Exa 13.5 Determine the range the local oscillator be tuned

```
//Ex:13.5
clc;
clear;
close;
f_rf_1=88;//in MHz
f_rf_2=108;//in MHz
f_if=10.7;//in MHz
f_lo_1=f_rf_1+f_if;
f_lo_2=f_rf_2+f_if;
printf("The range local oscillator be tuned =%f MHz
    & %f MHz",f_lo_1,f_lo_2);
```

Scilab code Exa 13.6 Determine the range the local oscillator be tuned

```
//Ex:13.6
clc;
clear;
close;
f_rf_1=88;//in MHz
f_rf_2=108;//in MHz
f_if=10.7;//in MHz
f_lo_1=f_rf_1+f_if;
f_lo_2=f_rf_2+f_if;
printf("The range local oscillator be tuned =%f MHz
    & %f MHz",f_lo_1,f_lo_2);
```

Scilab code Exa 13.7 Determine the radiated power

```
//Ex:13.7
clc;
clear;
close;
r=12;//in ohms
```

```
i=0.5;//in amps
P_r=i*i*r;//in W
printf("Power radiated = %d W",P_r);
```

Scilab code Exa 13.8 Determine the power and radiation efficiency

```
//Ex:13.8
clc;
clear;
close;
r=2;//in ohms
i=0.5;//in amps
P_r=4;//in W
P_loss=i*i*r;
P_eff=(P_r/(P_r+P_loss))*100;
printf("The power loss = %f W",P_loss);
printf("\n The power loss = %f %%",P_eff);
```