Scilab Textbook Companion for
Electronic Circuits
by M. H. Tooley¹

Created by
Karan Bhargava
b.tech
Electronics Engineering
Uttarakhand Technical University
College Teacher
Vatsalya Sharma
Cross-Checked by
Ganesh R

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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)

**Equ** Equation (Particular equation of the above book)

**AP** Appendix to Example (Scilab Code that is an Appendix 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

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

Scilab code Exa 1.5 Express angle in degrees

```
1 //Exa:1.5
2 clc;
3 clear;
4 close;
5 ang_r=2.5; // given
6 ang_d=2.5*180/%pi; // angle in degrees
7 printf("%f radians angle is %f degrees",ang_r,ang_d);
```
Scilab code Exa 1.6 Calculate the current in milliamp

1 //Exa:1.6
2 clc;
3 clear;
4 close;
5 i_amp=0.075;//given
6 i_milamp=i_amp*1000;//current in milliamp.
7 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

1 //Exa:1.7
2 clc;
3 clear;
4 close;
5 fq_khz=1495;//given
6 fq_Mhz=fq_khz/1000;
7 printf("%f kHz frequency is %f MHz", fq_khz, fq_Mhz);

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

1 //Exa:1.8
2 clc;
3 clear;
4 close;
5 c_pF=27000;//given
6 c_uF=c_pF/1000;
7 printf("%f picofarad capacitance is %f microfarad", c_pF, c_uF);
Scilab code Exa 1.9 Express current in amp

1 //Exa:1.9
2 clc;
3 clear;
4 close;
5 c_mA=7.25; //given
6 c_A=c_mA*1000;
7 printf("%f milliampere current is %f ampere",c_mA,c_A);

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

1 //Exa:1.10
2 clc;
3 clear;
4 close;
5 vg_v=3.75*10^-6; //given
6 vg_mv=vg_v*1000;
7 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

1 //Exa:1.11
2 clc;
3 clear;
4 close;
5 r=33000; //in ohms
\textbf{Scilab code Exa 1.12} Calculate the charge transferred in 20ms by 45 microamp current

1 \texttt{/Ex:1.12}
2 \texttt{clc;}
3 \texttt{clear;}
4 \texttt{close;}
5 \texttt{t=20*10^{-3};// in sec}
6 \texttt{i=45*10^{-6};// in amp}
7 \texttt{q=i*t*10^{-9};}
8 \texttt{printf("Charge transferred = \text{\%f nC},q");}

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

1 \texttt{/Ex:1.13}
2 \texttt{clc;}
3 \texttt{clear;}
4 \texttt{close;}
5 \texttt{p=0.3;\text{in watts}}
6 \texttt{v=1500;\text{in volts}}
7 \texttt{i=(p/v)*10^{-6};}
8 \texttt{printf("Current supplied = \text{\%d microamp},i");}

\textbf{Scilab code Exa 1.14} Calculate the current through resistor 12ohm with 6V battery
1 //Ex:1.14
2 clc;
3 clear;
4 close;
5 r=12; //in ohms
6 v=6; //in volts
7 i=(v/r);
8 printf("Current = %f Amp",i);

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

1 //Ex:1.15
2 clc;
3 clear;
4 close;
5 r=56; //in ohms
6 i=0.1; //in amp
7 v=i*r;
8 printf("Voltage dropped = %f volts",v);

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

1 //Ex:1.16
2 clc;
3 clear;
4 close;
5 v=15; //in volts
6 i=0.001; //in amp
7 r=v/i;
8 printf("Resistance = %d ohms",r);
Scilab code Exa 1.17 Calculate the resistance of 8m length cooper wire

```scilab
//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

```scilab
//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
Scilab code Exa 1.19 Calculate the power supplied in 100ohm with 3V drop

```matlab
//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

```matlab
//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

```matlab
//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

1 //Ex:1.22
2 clc;
3 clear;
4 close;
5 v=600; //in volts
6 d=25*10^-3; //in meters
7 E=(v)/d;
8 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

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

Scilab code Exa 1.24 Calculate the total flux by flux density

1 //Ex:1.24
2 clc;
Scilab code Exa 1.25 Calculate the relative permitivity of steel at different given flux density

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

Scilab code Exa 1.26 Calculate the current to establish given flux

```scilab
//Ex:1.26
clear;
close;
flux=0.8*10^-3; // in Tesla
a=(500*10^-6); // in sq. meter
l=0.6; // in meter
N=800;
```
9 \( B = \text{flux/a}; \)
10 \textbf{printf}("Flux Density = \%e Tesla", B);
11 \text{H}=3500; // in A/m
12 \text{i}=(\text{H*1})/\text{N};
13 \textbf{printf}("\n Current required = \%f amp.s", \text{i});
Chapter 2
Passive Components

Scilab code Exa 2.1 Determine the tolerance of resistor

```plaintext
//Ex:2.1
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

```plaintext
//Ex:2.2
clear;
close;
r=39; // in ohms
```
6 \textit{v=9}; // in volts
7 i=(v/r); // in Amps
8 \texttt{printf} ("Current = \%d mA", i*1000);
9 tol=0.1; // i.e. 10%
10 r_{\text{min}}=r-(tol\times r);
11 i_{\text{max}}=v/r_{\text{min}};
12 r_{\text{max}}=r+(tol\times r);
13 i_{\text{min}}=v/r_{\text{max}};
14 \texttt{printf} ("\nMax. Current = \%f mA & Min. Current= \%f mA"
, i_{\text{max}}\times 1000, i_{\text{min}}\times 1000);

\begin{verbatim}
Scilab code Exa 2.3 Determine value and type of resistor used for 100mA

1 //Ex:2.3
2 clc;
3 clear;
4 close;
5 v=28; // in volts
6 i=0.1; // in A
7 r=v/i;
8 p=v*i;
9 \texttt{printf} ("Resistance Value = \%f ohms & Power
dissipated = \%f W", r, p);

\end{verbatim}

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

1 //Ex:2.4
2 clc;
3 clear;
4 close;
5 r=10*(10^{-2});
6 \texttt{printf} ("Resistor value = \%d ohm", r);

20
Scilab code Exa 2.5 Determine the value and tolerance of resistor of red violet orange gold

```scilab
//Ex: 2.5
clc;
clear;
close;
r = 27*(10^3);
printf("Resistor value = %.0f ohm", r);
printf("\nTolerance = 5 \%\%");
```

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

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

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

```scilab
//Ex: 2.7
clc;
clear;
```
Scilab code Exa 2.8 Determine the bands corresponding to 2pt kohm of tolerance 2 percent

```scilab
clc;
clear;
close;
r=22*(10^-3);
printf(“Bands are Red, Red, Red, Red”);
```

Scilab code Exa 2.9 Determine the bands corresponding to 4R7K

```scilab
clc;
clear;
close;
printf(“Resistance = 4.7 ohm with 10% tolerance”);
```

Scilab code Exa 2.10 Determine the bands corresponding to 330RG

```scilab
clc;
clear;
close;
printf(“Resistance = 330 ohms with 2% tolerance”);
```
Scilab code Exa 2.11 Determine the bands corresponding to R22M

```matlab
//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

```matlab
//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("\nEffective resistance in parallel = \%f ohms",r_parel);
```

Scilab code Exa 2.13 Determine the effective resistance of the circuit

```matlab
//Ex: 2.13
clc;
```
3 clear;
4 close;
5 r1=4.7;// in ohms
6 r2=47;// in ohms
7 r3=12;// in ohms
8 r4=27;// in ohms
9 r5=r3+r4;
10 r_parel=((1/r5)+(1/r2))^ -1;
11 r_eff=r_parel+r1;
12 printf("Effective resistance = %d ohms",r_eff);

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

1 //Ex:2.14
2 clc;
3 clear;
4 close;
5 printf("Two 100 ohm resistor of 1 W");

Scilab code Exa 2.15 Determine the resistance at 80 degree

1 //Ex:2.15
2 clc;
3 clear;
4 close;
5 temp_coeff=0.001;// in per degree centigrade
6 r_o=1500;// in ohm
7 t=80;// temperature diff.
8 r_t=r_o*(1+(temp_coeff)*t)
9 printf("Resistance at %d degree = %d ohms",t,r_t);
Scilab code Exa 2.16  Determine the resistance at 90 degree

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

Scilab code Exa 2.17  Determine the resistor temperature coeff

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

Scilab code Exa 2.18  Determine the current flow
Scilab code Exa 2.18 Determine the charged stored

```matlab
//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

```matlab
//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 uF capacitor

```matlab
//Ex:2.20
clc;
clear;
close;
C=47*10^-6; //in farads
W=4; //energy in joules
V=sqrt(W/(0.5*C));
```
Scilab code Exa 2.21 Determine the required plate area for 1 nF capacitor

```scilab
//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

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

```scilab
//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

```scilab
//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 = %fnF", C_eff);
```
**Scilab code Exa 2.26** Determine the series combination of capacitors and their voltage rating

```scilab
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

```scilab
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

```scilab
clc;
clear;
close;
```
Scilab code Exa 2.29 Determine the numbers of turns required

```scilab
//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

```scilab
//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

```scilab
//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

```scilab
//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("\nCurrent I3 = %f A",i3);
```

---

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

```scilab
//Ex:3.2
clc;
clear;
```
Scilab code **Exa 3.3** Determine the voltage and current in circuit

```scilab
//Ex:3.3
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 3.4** Determine the output when no load and loaded by 10kohm

```scilab
//Ex:3.4
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);
```
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 = %.2f A",V_out);
printf("\noutput voltage when loaded by 10kohms = %.2f 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 = %.0f 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;
Scilab code Exa 3.7 Determine the current flow in 100 ohm load

```plaintext
//Ex:3.7
c1c;
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

```plaintext
//Ex:3.8
c1c;
clear;
close;
I_sc=19; //in uA
R=1000;
```
Scilab code Exa 3.9 Determine the voltage produced

```scilab
//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

```scilab
//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)));
```
12  printf("Charging current after %f sec = %f A\", t1, i1)
13  printf("\nCharging current after %f sec = %f A\", t2, i2);

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

1  //Ex:3.11
2  clc;
3  clear;
4  close;
5  c=10*10^{-6}; // in farads
6  r=47*10^{3}; // in ohms
7  V_s=20; // in volts
8  V_c=10;
9  t=-c*r*log(V_c/V_s);
10  printf("time taken = %f sec.\", t);

Scilab code Exa 3.12 Determine the capacitor voltage 1 minute later

1  //Ex:3.12
2  clc;
3  clear;
4  close;
5  c=150*10^{-6}; // in farads
6  r=2*10^{6}; // in ohms
7  V_s=150; // in volts
8  V_c=0.8187*V_s;
9  printf("Capacitor voltage = %f V\", V_c);
Scilab code Exa 3.13 Determine the C R values for sq wave of 1kHz

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

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

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

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

```scilab
1 //Ex:3.15
2 clc;
3 clear;
4 close;
5 L=6;//in henry
6 r=24;//in ohms
7 t=0.1;//in sec.
8 V_s=12;//in volts
```
Scilab code Exa 3.16 Determine the inductor voltage 20ms after supply first connected

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

```scilab
i=(V_s/r)*(1-%e^(-t*r/L));
printf("current = %f A",i);
```
Chapter 4

Alternating voltage and current

Scilab code Exa 4.1 Determine the instantaneous voltage

```matlab
//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 2.5 ms = %f V", V1);
printf("\nVoltage at 15 ms = %f V", V2);
```

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

```matlab
//Ex: 4.2
clc;
clear;
```
4 close;
5 f=400; // in Hz
6 T=1/f;
7 printf("Time period of %d Hz waveform = %f sec",f,T);

____________________________

Scilab code Exa 4.3 Determine the freq of 40 ms waveform

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

____________________________

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

1 //Ex:4.4
2 clc;
3 clear;
4 close;
5 V_rms=240; // in Volts
6 V_pk=1.414*V_rms;
7 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

1 //Ex:4.5
### Scilab code Exa 4.6 Determine the rms current

```scilab
//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

```scilab
//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(" Reactance at 10kHz = %f ohm", X_L2);

Scilab code Exa 4.10 Determine the reactance of 1mH at 100Hz and 10kHz
Scilab code Exa 4.11 Determine the impedance of the circuit and current from supply

```scilab
//Ex:4.11
clc;
clear;
close;
C=2*10^-6;
f=400;
V=115;
r=199;
x_C=1/(2*%pi*f*C);
z=sqrt(r^2+x_C^2);
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 current from supply

```scilab
//Ex:4.12
```
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("Voltage developed = %f V", v);

Scilab code Exa 4.15 Determine the value of secondary 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("Secondary 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;
8  \text{\textit{N}}_s = \text{\textit{N}}_p \times \frac{\text{\textit{V}}_s}{\text{\textit{V}}_p}; \\
9  \text{\textit{i}}_s = 2.5; \\
10 \text{\textit{i}}_p = \text{\textit{N}}_s \times \frac{\text{\textit{i}}_s}{\text{\textit{N}}_p}; \\
11 \texttt{printf(}"\text{Secondry turns = } %d \text{ "},\text{\textit{N}}_s\texttt{);} \\
12 \texttt{printf(}"\text{\texttt{\textbackslash nprimary current = } %f A"},\text{\textit{i}}_p\texttt{);} \\

\text{\textit{\textbackslash n}}
Chapter 5

Semiconductors

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

```scilab
1 //Ex:5.1
2 clc;
3 clear;
4 close;
5 v1=0.43; //volts
6 i1=2.5*10^-3; //in Amps.
7 v2=0.65; //volts
8 i2=7.4*10^-3; //in Amps.
9 r1=v1/i1;
10 r2=v2/i2;
11 printf("Diode resistance for 2.5A current = %d ohms",r1);
12 printf("\nDiode resistance for 0.65V = %f ohms",r2);
```

Scilab code Exa 5.2 Determine the series resistor required
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;
```
9 `printf("Emitter current = \%f ohms & hfe = \%d", 
    I_e,hfe);

Scilab code Exa 5.5 Determine the Ib base current and hfe
1 //Ex: 5.5
2 clc;
3 clear;
4 close;
5 I_e=98; // in mA
6 I_c=97;
7 I_b=I_e-I_c;
8 hfe=I_c/I_b;
9 `printf("Emitter current = \%d mA & hfe = \%d", 
    I_b,hfe);

Scilab code Exa 5.6 Determine the hfe required and collector power dissipation
1 //Ex: 5.6
2 clc;
3 clear;
4 close;
5 I_c=1.5; // in A
6 I_b=50*10^-3;
7 V_ce=6; // volts
8 hfe=I_c/I_b;
9 P=I_c*V_ce;
10 `printf("hfe required = \%d",hfe);
11 `printf("\n collector power dissipation = \%d W",P);

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

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

Scilab code Exa 5.8 Determine the change in drain current

```scilab
1  //Ex:5.8
2  clc;
3  clear;
4  close;
5  dV_gs=0.025;
6  g_fs=-0.5;
7  dI_d=dV_gs*g_fs;// in mA
8  I_d1=50*10^-3;// in mA
9  I_d2=dI_d+I_d1;
10 printf("Change in drain current = %f A",dI_d);
11 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

```matlab
//Ex:6.1
clc;
clear;
close;
V_p=220;
V_s = V_p / 44;
V_pk = 1.414 * V_s; % 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

```matlab
//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

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

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

```scilab
//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("\nregulation. = \%f \%", Regulation);
```
Chapter 7

Amplifiers

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

```matlab
1 //Ex:7.1
2 clc;
3 clear;
4 close;
5 I_i=4;
6 V_o=2;
7 V_i=50*10^-3;
8 I_o=200;
9 A_v=V_o/V_i;
10 A_i=I_o/I_i;
11 printf(" Volt gain = %f ",A_v);
12 printf("\n Current gain = %f ",A_i);
13 printf("\n Power gain = %f ",A_i*A_v);
```

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

55
//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;
```scilab
printf(" percentage change in overall volt gain = %f \\
%%",dG);

Scilab code Exa 7.5 Determine amount of feedback required

1  //Ex:7.5
2  clc;
3  clear;
4  close;
5  A=100;
6  G=20;
7  b=(1/G)-(1/A);
8  printf("amount of feedback required = %f ",b);

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

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

Scilab code Exa 7.7 Determine of load resistance required

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

```scilab
//Ex:7.8
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 7.9 Determine quiescent value of collector current and voltage and peak to peak output voltage

```scilab
//Ex:7.9
clc;
clear;
close;
V=9;
V_e=2;
R4=1000;
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);
```
1  //Ex:7.9
2  clc;
3  clear;
4  close;
5  V_pp=14.8-3.3;
6  printf("Collector quiescent voltage = 9.2 V");
7  printf("\nCollector quiescent current = 7.3mA");
8  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

```scilab
//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

```scilab
//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

1 //Ex:8.3
2 clc;
3 clear;
4 close;
5 V_out=10;
6 t=4;
7 SR=V_out/t;
8 printf("Slew rate = %f V/us", SR);

Scilab code Exa 8.4 Determine the time taken to change level

1 //Ex:8.4
2 clc;
3 clear;
4 close;
5 V_out=2;
6 SR=15; // in V/us
7 t=V_out/SR;
8 printf("Time taken = %f us", t);

Scilab code Exa 8.6 Determine the circuit parameters using opamps

1 //Ex:8.6
2 clc;
3 clear;
4 close;
5 R_in=10000;
6 f1=250;
7 f2=15000;
8 C_in=0.159/(f1*R_in);
9 C_f=0.159/(f2*R_in);
10 printf ("C_f = %e F",C_f);
Chapter 9

Oscillators

**Scilab code Exa 9.1** Determine the freq of oscillation

```scilab
//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

```scilab
//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

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

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

```plaintext
//Ex:12.2
clc;
clear;
close;
C=100*10^-6;
t_on=60;
```
7 \( R = \frac{t_{on}/(1.1*C)}{1000}; \)
8 \textit{printf}("R= %f kohm",R);
Chapter 13

Radio

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

1  //Ex:13.1
2  clc;
3  clear;
4  close;
5  c=3*10^8;
6  wl=15;
7  f=c/wl;
8  printf("The frequency =\%d Hz",f);

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

1  //Ex:13.2
2  clc;
3  clear;
4  close;
5  c=3*10^8;
6  f=150*10^6;
Scilab code Exa 13.3 Determine the velocity of propagation of radio signal of 30MHz and 8m wavelength

```scilab
1 //Ex:13.3
2 clc;
3 clear;
4 close;
5 wl=8;
6 f=30*10^6;
7 v=f*wl;
8 printf("The velocity of propagation =%d m/s",v);
```

Scilab code Exa 13.4 Determine the two possible BFO freq

```scilab
1 //Ex:13.4
2 clc;
3 clear;
4 close;
5 f_rf=162.5;  // in kHz
6 f_af=1.25;   // in kHz
7 f_bfo_max=f_rf+f_af;
8 f_bfo_min=f_rf-f_af;
9 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
Scilab code Exa 13.6 Determine the range the local oscillator be tuned

```scilab
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

```scilab
clc; clear; close;
r=12; // in ohms
```
Scilab code Exa 13.8 Determine the power and radiation efficiency

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

---

cclc;
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);

---