Scilab Textbook Companion for Engineering Physics by P. K. Basu & H. Dhasmana[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

interference

Scilab code Exa 1.1 The Fringe width in Youngs Double Slit Experiment

```
clc
//
//
//

//Variable declaration
D=0.5           //Distance from Screen in cm
d=0.5          //Distance between parallel slits in cm
lambdaa=5890   //Wavelength

//Calculations
Beta=(D*lambdaa)/(d)/10**4 // in degrees

//Result
printf("\n The Fringe width in Youngs Double Slit
   Experiment is Beta= %1.4f*10**-3 m", Beta)
```

Scilab code Exa 1.2 The Double slit separation 2d

```
clc
//
//
//

//Variable declaration
D=2                //Distance from screen
lambdaa=5100       //Wavelength
Beta=0.02          //Fringe Width
x=10               //No. of fringes


//Calculations
d=(x*D*lambdaa)/Beta/10**6

//Result
printf("\n The Double slit separation 2d= %0.3f mu m
   ",d)
```

Scilab code Exa 1.3 The Wavelength lamda

```
clc
//
//
//

//Variable declaration
D=1                        //Distance from screen
Beta=0.31*10**-3           //Fringe Width
d=1.9*10**-3               //Slit separation


//Calculations
lambdaa=(Beta*d*10**6)/D

```

```
//Result
printf("\n The Wavelength lamda=%0.4f *10**-6 m",
    lambdaa)
```

Scilab code Exa 1.4 The position of the 10th fringe

```
clc
//
//
//

//Variable declaration
D=0.04                       //Distance from screen
lambdaa=5890*10**-10          //Wavelength
d=2*10**-3                   //Slit separation
n=10                         //No. of fringes


//Calculations
x10=(n*D*lambdaa*10**-2)/d

//Result
printf("\n The position of the 10th fringe is %0.3f
    *10**-4 m",x10)
```

Scilab code Exa 1.5 The position of the 10th fringe

```
clc
//
//
//

//Variable declaration
```

```
D=0.8                           //Distance from screen
lambdaa=5890*10**-10            //Wavelength
Beta=9.424*10**-4               //Fringe Width


//Calculations
d=(D*lambdaa*10**-2)/Beta

//Result
printf("\n The position of the 10th fringe is %e
   *10**-4 m",d)
```

Scilab code Exa 1.6 The Fringe width observed at a distance of 1m from BP

```
clc
//
//
//

//Variable declaration
D=1.1                           //Distance from screen
lambdaa=5900*10**-10            //Wavelength
d=0.00174                       //Fringe separation


//Calculations
Beta=(D*lambdaa*10**-1)/d

//Result
printf("\n The Fringe width observed at a distance
   of 1m from BP is %1.1f *10**-5 m",Beta)
```

Scilab code Exa 1.7 The Angle of prism at the vertex

```
clc
//
//
//

//Variable declaration
D=2                        //Distance from screen
lambdaa=5890*10**-10       //Wavelength
mu=1.5                     //refractive index of glass
a=0.25                     //distance from slit
Beta=0.2*10**-3            //Fringe width


//Calculations
alpha=(D*lambdaa*180*10**-6)/(2*a*(mu-1)*Beta*3.14)
A=(180-2*((alpha)))


//Result
printf("\n The Angle of prism at the vertex is is %i
    deg 17.8 min",A)
```

Scilab code Exa 1.8 The Wavelength

```
clc
//
//
//

//Variable declaration
D=1                             //Distance from screen
mu=1.5                          //refractive index of
   glass
```

```
a=0.5                           //distance from slit
Beta=0.0135*10**-2              //Fringe width
alpha=0.0087                    //angleof prism


//Calculations
lambdaa=(Beta*2*a*(mu-1)*alpha*10**10)/D

//Result
printf("\n The Wavelength is %0.3f Angstrom",lambdaa
   )
```

Scilab code Exa 1.9 The fringe width would become

```
clc
//
//
//

//Variable declaration
d=0.75                        //slit separation
Beta=0.087*10**-3             //Fringe width


//Calculations
Beta2=Beta*10**3/d

//Result
printf("\n The fringe width would become %0.3f mm",
   Beta2)
```

Scilab code Exa 1.10 The wavelength

```
clc
//
//
//

//Variable declaration
d=7.5*10**-4                        //slit separation
Beta=0.094*10**-2                   //Fringe width
D=1.2                               //Distance from
    Screen


//Calculations
lambdaa=(Beta*d*10**10)/D

//Result
printf("\n The wavelength is %i Angstrom",lambdaa)
```

Scilab code Exa 1.11 The Fringe width

```
clc
//
//
//

//Variable declaration
d=3.6125*10**-3                     //slit separation
D=1                                 //Distance from
    Screen
lambdaa=5870*10**-10                //Wavelength


//Calculations
Beta=(D*lambdaa*10**4)/d

```

```
//Result
printf("\n The Fringe width is %0.3f *10**-4 m",Beta
    )
```

Scilab code Exa 1.12 The wavelength

```
clc
//
//
//

//Variable declaration
d=0.3*10**-2                        //slit separation
D=1                                    //Distance from
    Screen
Beta=0.0195*10**-2                //Wavelength


//Calculations
lambdaa=(Beta*d*10**10)/D

//Result
printf("\n The wavelength is %i *10**-10 m",lambdaa)
```

Scilab code Exa 1.13 The number of fringes would be

```
clc
//
//
//

//Variable declaration
n1=62                          //fringes
```

```
lambdaa1=5893*10**-10    //Wavelength 1
lambdaa2=5461*10**-10    //Wavelength 2


//Calculations
n2=(n1*lambdaa1)/lambdaa2

//Result
printf("\n The number of fringes would be %i ",round(n2))
```

Scilab code Exa 1.14 The refractive index

```
clc
//
//
//

//Variable declaration
lambdaa=5.46*10**-7    //Wavelength
t=6.3*10**-6           //thickness

//Calculations
mu=((6*lambdaa)/t)+1

//Result
printf("\n The refractive index is  %0.3f ",mu)
```

Scilab code Exa 1.15 The refractive index

```
clc
//
//
```

```
//

//Variable declaration
s=2.143*10**-3
mu=1.542  //refractive index
lambdaa=5893*10**-10 //Wavelength
Beta=0.347*10**-3

//Calculations
t=(s*lambdaa*10**6)/(Beta*(mu-1))

//Result
printf("\n The refractive index is  %0.2f mu m",t)
```

Scilab code Exa 1.16 The number of dark bands seen betwween 4000 A and 5000A

```
clc
//
//
//

//Variable declaration
mu=1.4                   //Refractive index
cosr=0.8631
t=0.01*10**-3            //thickness
lambda1=4000*10**-10     //Wavelength 1
lambda2=5000*10**-10     //Wavelength 2


//Calculations
n1=(2*mu*t*cosr)/lambda1
n2=(2*mu*t*cosr)/lambda2
deln=(n1)-(n2)

```

```

//Result
printf("\n The number of dark bands seen betwween
   4000 A and 5000A  is %i ",deln)
```

Scilab code Exa 1.17 The Thickness

```
clc
//
//
//

//Variable declaration
mu=1.33                 //Refractive index
cosr=0.7989
lambda1=6.1*10**-5      //Wavelength 1
lambda2=6*10**-5        //Wavelength 2


//Calculations
t=(lambda1*lambda2*10**-5)/(2*mu*cosr*(lambda1-
   lambda2)*10**-5)

//Result
printf("\n The Thickness is  %0.4f  cm",t)
```

Scilab code Exa 1.18 The Thickness

```
clc
//
//
//

```

```
//Variable declaration
n=8                    //number of fringes
lambdaa=5893*10**-10    //Wavelength
mu=1.5                 //Refractive index
cosr=(2*sqrt(2))/3
//Calculations
t=(n*lambdaa*10**6)/(2*mu*cosr)

//Result
printf("\n The Thickness is  %0.3f  mu m",t)
```

Scilab code Exa 1.19 The order of interference of dark band

```
clc
//
//
//

//Variable declaration
mu=4/3              //refractive index
t=1.5               //thickness
cosr=0.7603
lambdaa=5*10**-7    //Wavelength


//Calculations
n=(2*mu*t*cosr*10**-6)/lambdaa

//Result
printf("\n The order of interference of dark band is
    %i  ",n)
```

Scilab code Exa 1.20 visible range for n

```
clc
//
//
//

//Variable declaration
mu=1.33     //refractive index
n1=0
n2=1
n3=2
t=5*10**-7 //thickness


//Calculations
lambda1=(4*mu*t*10**10)/(2*n1+1)
lambda2=(4*mu*t*10**10)/(2*n2+1)
lambda3=(4*mu*t*10**10)/(2*n3+1)

//Result
printf("\n For n=0 Lambda is %0.3f ",lambda1)
printf("\n For n=1 Lambda is %i ",lambda2)

printf("\n For n=2 Lambda is %0.3f ",lambda3)
printf("\n Out of these only %0.3f lies in the
   visible range for n=2",lambda3)
```

Scilab code Exa 1.21 The Wavelength

```
clc
//
//
//

//Variable declaration
R=100    //radius
```

```
D25=0.8 //Diameter of the 25th ring
D5=0.3  //Diameter of the 5th ring
p=20


//Calculations
lambdaa=((D25**2)-(D5**2))*10**8/(4*20*100)

//Result
printf("\n The Wavelength is %i Angstrom",lambdaa)
```

Scilab code Exa 1.22 The Radius

```
clc
//
//
//

//Variable declaration
n=10                    //no. of ring
D10=0.5                 //Diameter of the 10th ring
lambdaa=5893*10**-8     //Wavelength

//Calculations
R=(D10**2)/(4*10*5893*10**-8)
t=(D10**2)*10**4/(8*R)

//Result
printf("\n The Thickness is %0.3f cm",t)
printf("\n The Radius is %0.1f cm",R)
```

Scilab code Exa 1.23 The Diameter of the nth dark ring

```
clc
//
//
//

//Variable declaration
n=59                    //no. of ring
lambdaa=6*10**-7        //Wavelength
R=0.9                   //Radius

//Calculations
D59=sqrt(4*R*n*lambdaa)*10**2

//Result
printf("\n The Diameter of the nth dark ring is %0.3
   f cm",D59)
```

Scilab code Exa 1.24 The Diameter of the 20th dark ring

```
clc
//
//
//

//Variable declaration
n=20                    //no. of ring
lambdaaR=0.0103         //Wavelength*R

//Calculations
D20=sqrt(4*n*lambdaaR)

//Result
printf("\n The Diameter of the 20th dark ring is %0
   .3f cm",D20)
```

Scilab code Exa 1.25 The Radius

```
clc
//
//
//

//Variable declaration
D3=10**-2
lambdaa=5890*10**-10


//Calculations
R=(D3*sqrt(3))*10**-2/(24*lambdaa)

//Result
printf("\n The Radius is %0.2f m",R)
```

Scilab code Exa 1.26 The Wavelength

```
clc
//
//
//

//Variable declaration
n=8               //no. of ring
D8=0.72*10**-2  //Diameter of the 8th ring
R=3               //Radius


//Calculations
```

```
lambdaa=(D8**2)*10**10/((2*(2*n-1))*R)

//Result
printf("\n The Wavelength is %i Angstrom",lambdaa)
```

Scilab code Exa 1.27 The Velocity in the liquid

```
clc
//
//
//

//Variable declaration
c=3*10**10   //Speed of Light in Vacuum
mu=1.44      //Refractive Index

//Calculations
u=c*10**-10/mu

//Result
printf("\n The Velocity in the liquid is %0.2f
   *10**10   m/s",u)
```

Scilab code Exa 1.29 The Distance between 5th and 15th Dark ring

```
clc
//
//
//

//Variable declaration
lambdaa=5400*10**-10   //Wavelength
n1=5
```

```
n2=15
R=100          //Radius of both rings

//Calculations
r5=sqrt((R*n1*lambdaa)/2)
r15=sqrt((R*n2*lambdaa)/2)
d=(r15)-(r5)


//Result
printf("\n The Distance between 5th and 15th Dark
    ring is %0.3f m",d)
```

Scilab code Exa 1.30 The Refractive Index

```
clc
//
//
//

//Variable declaration
l=0.0025 //Distance moved
t=0.005  //thickness of mica sheet

//Calculations
mu=((l/t)+1)

//Result
printf("\n The Refractive Index is %0.3f ",mu)
```

Scilab code Exa 1.31 The Wavelength

```
clc
```

```
//
//
//

//Variable declaration
l=0.02948*10**-3 //Distance moved
n=100             //number of fringes

//Calculations
lambdaa=(2*l)*10**10/n

//Result
printf("\n The Wavelength is %i Angstrom",lambdaa)
```

Scilab code Exa 1.32 The Distance by which the mirror moved

```
clc
//
//
//

//Variable declaration
lambdaa1=5896  //Wavelength1
lambdaa2=5890  //Wavelength2


//Calculations
l=(lambdaa1*lambdaa2)/(2*(lambdaa1-lambdaa2))

//Result
printf("\n The Distance by which the mirror moved is
    %i *10**-10 m",l)
```

Chapter 2

diffraction

Scilab code Exa 2.1 The Difference between two wavelengths

```
clc
//
//
//

//Variable declaration
lambdaa=5893*10**-10   //Wavelength
l=0.2945*10**-3        //Distance by which mirror is
    displaced


//Calculations
dellambdaa=(lambdaa**2)*10**10/(2*l)

//Result
printf("\n The Difference between two wavelengths is
    %0.1f Angstrom",dellambdaa)
```

Scilab code Exa 2.2 The Total Linear Width of central maxima

```
clc
//
//
//

//Variable declaration
theta=6*10**-3 //Angular Width
D=1            //Distance of Screen

//Calculations
Totalangularwidth=2*theta
tlw=Totalangularwidth*D*10**2

//Result
printf("\n The Total Linear Width of central maxima
   is %0.3f cm",tlw)
```

Scilab code Exa 2.3 The Wavelength

```
clc
//
//
//

//Variable declaration
e=0.14   //width of the slit
y=1.6    //Distance of center of dark band from
   middle of central bright band
n=2      //no. of dark band
D=2      //Distance from the slit

//Calculations
lambdaa=((e*y)/(D*n))*10**5

//Result
```

```
printf("\n The Wavelength is %i Angstrom",lambdaa)
```

Scilab code Exa 2.4 The Width of the slit

```
clc
//
//
//

//Variable declaration
lambdaa=5000*10**-8   //Wavelength
theta=30              //Angular Width

//Calculations
thetarad=(%pi/180)*(theta)
sinetheta=sin(thetarad)
e=(lambdaa)/(sinetheta)

//Result
printf("\n The Width of the slit is  %0.4f cm",e)
```

Scilab code Exa 2.6 The Wavelength

```
clc
//
//
//

//Variable declaration
y=5*10**-3      //First Minima
D=2             //Distance of screen
e=0.2*10**-3    //Slit width

```

```
//Calculations
lambdaa=((e*y)/D)*10**10

//Result
printf("\n The Wavelength is %d Angstrom",lambdaa)
```

Scilab code Exa 2.7 The Wavelengths

```
clc
//
//
//

//Variable declaration
y=0.005                   //First Minima
D=1                       //Distance of screen
e=0.5*10**-2              //Slit width

//Calculations
yd=(y/D)
sinyd=(sin(yd))
lambdaa1=((e*sinyd)/4)*10**9
lambdaa2=((e*sinyd)/5)*10**9

//Result
printf("\n The Wavelengths are %4.0f  Angstrom & %4
    .0f   Angstrom",lambdaa1,lambdaa2)
```

Scilab code Exa 2.8 The Wavelength

```
clc
//
//
```

```
//

//Variable declaration
n=2                  //order of spectral line
theta=30             //Angular Width
invde=5000           //Inverse of diffraction
   element

//Calculations
thetarad=(%pi/180)*(theta)
sinetheta=sin(thetarad)
lambdaa=((sinetheta)/(n*invde))*10**8

//Result
printf("\n The Wavelength is %i Angstrom",lambdaa)
```

Scilab code Exa 2.9 The Angular Difference

```
clc
//
//
//

//Variable declaration
lambdaa=5000*10**-8    //Wavelength
invde=6000             //Diffraction element inverse

//Calculations
sinetheta1=lambdaa*invde
sinetheta3=lambdaa*invde*3
theta1=(180/%pi)*(asin(sinetheta1))
theta3=(180/%pi)*(asin(sinetheta3))
deltheta=theta3-theta1

//Result
```

```
printf("\n The Angular Difference is %2.1f Degrees",deltheta)
```

Scilab code Exa 2.10 The orders visible would be

```
clc
//
//
//

//Variable declaration
lambdaa=5000*10**-8    //Wavelength
invde=(2620/2.54)               //Diffraction element inverse

//Calculations
n=(1/(lambdaa*invde))
//Result
printf("\n The orders visible would be %i ",n)
```

Scilab code Exa 2.12 The orders visible will be from

```
clc
//
//
//

//Variable declaration
lambdaa1=4000*10**-8       //Wavelength1
lambdaa2=7000*10**-8       //Wavelength2
invde=4000                 //Diffraction element inverse

```

```
//Calculations
n1=(1/(lambdaa1*invde))
n2=(1/(lambdaa2*invde))
//Result
printf("\n The orders visible will be from %i  to
   %i  order Spectrum",n2,n1)
```

Scilab code Exa 2.13 The number of line cm in grating

```
clc
//
//
//

//Variable declaration
lambdaa=5000*10**-8      //Wavelength
theta=30                  //Angular Width


//Calculations
thetarad=((%pi/180)*(theta))
invde=((2*lambdaa)/(sin(thetarad))**-1

//Result
printf("\n  The number of line cm in grating is %0.3
   f ",invde)
```

Scilab code Exa 2.14 The grating element

```
clc
//
//
//
```

```

//Variable declaration
lambdaa=6000*10**-8      //Wavelength
sinetheta=(3/4)          //Angular Width
n=4

//Calculations
gratingele=((n*lambdaa)/sinetheta)
//Result
printf("\n  The grating element is %0.5f cm",
   gratingele)
```

Scilab code Exa 2.15 The Angle of Diffraction

```
clc
//
//
//

//Variable declaration
lambdaa=6000*10**-8      //Wavelength
n=3
invde=200                //inverse of diffraction
   element

//Calculations
sinetheta=(n*lambdaa*invde)
thetarad=asin(sinetheta)
theta=(180/%pi)*(thetarad)
//Result
printf("\n  The Angle of Diffraction is %0.5f
   degrees",theta)
```

Scilab code Exa 2.16 The difference between the two wavelengths

```
clc
//
//
//

//Variable declaration
lambdaa=5000*10**-10      //Wavelength
theta=30                  //Angular Width
dtheta=0.01

//Calculations
thetarad=((%pi/180)*(theta))
dlambda=((lambdaa*cos(thetarad))/(sin(thetarad)))
   *10**8

//Result
printf("\n  The difference between the two
   wavelengths is %2.1f Angstrom",dlambda)
```

Scilab code Exa 2.17 The Maximum resolving power

```
clc
//
//
//

//Variable declaration
lambdaa=5000*10**-8      //Wavelength
N=40000                  //Grating lines
de=12.5*10**-5           //Diffraction element

//Calculations
RPmax=((de*N)/lambdaa)
```

```
//Result
printf("\n  The Maximum resolving power is %i or 10**5",RPmax)
```

Scilab code Exa 2.18 The Minimum number of lines in the grating

```
clc
//
//
//

//Variable declaration
lambdaa=5890                //Wavelength
dlambdaa=6                  //Difference in wavelengths
n=2                         //order

//Calculations
N=((lambdaa)/(n*dlambdaa))

//Result
printf("\n  The Minimum number of lines in the grating are %3.0f ",N)
```

Chapter 3

polarization

Scilab code Exa 3.1 The smallest wavelength that can be resolved in the 3rd order in 5896 Angstrom wavelength region

```
clc
//
//
//

//Variable declaration
lambdaa=5896                //Wavelength
N=60000                     //Total Number of lines
   in 10 cm
n1=2                        //order
n2=3                        //order

//Calculations
RP=n1*N
dlambda=((lambdaa)/(n2*N))

//Result
printf("\n  (a)The resolving power in second order
   is %0.3f ",RP)
printf("\n  (b) The smallest wavelength that can be
```

```
    resolved in the 3rd order in 5896 Angstrom
    wavelength region is %0.4f Angstrom",dlambda)
```

Scilab code Exa 3.2 The Angle of polarization

```
clc
//
//
//

//Variable declaration
mu=1.54          //refractive index of glass

//Calculations
ip=(180/%pi)*(atan(1.54))
r=90-ip

//Result
printf("\n The Angle of polarization is %2.0f
    Degrees",r)
```

Scilab code Exa 3.3 The Angle of polarization

```
clc
//
//
//

//Variable declaration
ip=60   //Angle of incidence

//Calculations
mu=tan((%pi/180)*(ip))
```

```
//Result
printf("\n The Angle of polarization is %1.4f
    Degrees",mu)
```

Scilab code Exa 3.4 The Angle of Refraction

```
clc
//
//
//

//Variable declaration
muwater=0.8660  //Refractive index of water

//Calculations
ip=(180/%pi)*(atan(muwater))
r=90-ip

//Result
printf("\n The Angle of Refraction is %2.2f Degrees"
    ,r)
```

Scilab code Exa 3.5 The thickness of the crystal

```
clc
//
//
//

//Variable declaration
lambdaa=6000*10**-10  //Wavelength
```

```
muo=1.55                    //Refractive index of ordinary
    rays
mue=1.54                    //Refractive index of extra
   ordinary rays

//Calculations
t=((lambdaa)/(2*(muo-mue)))*10**2

//Result
printf("\n The thickness of the crystal is  %0.3f cm
   ",t)
```

Scilab code Exa 3.6 The thickness of the crystal

```
clc
//
//
//

//Variable declaration
lambdaa=5893*10**-10   //Wavelength
muo=1.54                    //Refractive index of ordinary
    rays
mue=1.53                    //Refractive index of extra
   ordinary rays

//Calculations
t=((lambdaa)/(4*(muo-mue)))*10**2

//Result
printf("\n The thickness of the crystal is  %0.3f cm
   ",t)
```

Scilab code Exa 3.7 The thickness of the crystal

```
clc
//
//
//

//Variable declaration
lambdaa=5893*10**-10    //Wavelength
muo=1.551               //Refractive index of
   ordinary rays
mue=1.54                //Refractive index of extra
   ordinary rays

//Calculations
t=((lambdaa)/(2*(muo-mue)))*10**2

//Result
printf("\n The thickness of the crystal is %0.5f cm"
   ,t)
```

Scilab code Exa 3.8 The Amount of optical rotation produced

```
clc
//
//
//

//Variable declaration
lambdaa=4000*10**-10       //Wavelength
mul=1.55821                //Refractive index of left
    landed
mur=1.55810                //Refractive index of
   right landed
t=2*10**-3                 //thickness
```

```

//Calculations
orot=(180/%pi)*((2*3.14*(t*(mul-mur)))/lambdaa)

//Result
printf("\n The Amount of optical rotation produced is %3.0f degrees",orot)
```

Scilab code Exa 3.9 The Amount of optical rotation produced

```
clc
//
//
//

//Variable declaration
lambdaa=5000*10**-10        //Wavelength
muo=1.5418                  //Refractive index of ordinary rays
mue=1.5508                  //Refractive index of extra ordinary rays
t=0.032*10**-3                   //thickness

//Calculations
orot=((2*(t*(mue-muo)))/lambdaa)

//Result
printf("\n The Amount of optical rotation produced is %i radians",orot)
```

Scilab code Exa 3.10 The Specific rotation of sugar solution

```
clc
```

```
//
//
//

//Variable declaration
theta=6.5       //rotation of plane
l=2             //length
c=0.05          //concentration

//Calculations
s=(theta/(l*c))

//Result
printf("\n The Specific rotation of sugar solution
   is %i degree/(dm/(gm/cc)",s)
```

Scilab code Exa 3.11 The Concentration of sugar solution

```
clc
//
//
//

//Variable declaration
theta=12        //rotation of plane
l=2             //length
s=60            //Specific rotation

//Calculations
c=(theta/(l*s))

//Result
printf("\n The Concentration of sugar solution is %0
   .3f gm/cc",c)
```

Scilab code Exa 3.12 The Mass of sugar dissolved in 2 liter of water

```
clc
//
//
//

//Variable declaration
theta1=12          //rotation of plane
l1=2               //length
theta2=24          //rotation of plane
l2=3               //length
c1=0.08            //Concentration

//Calculations
s=((theta1)/(l1*c1))
c2=((theta2)/(s*l2))
Ms=10*10*10*c2
Ms2=Ms*2

//Result
printf("\n The Mass of sugar dissolved in 2 liter of
    water for optical rotation 24 deg is %3.1f gm",
   Ms2)
```

Scilab code Exa 3.13 The Difference in RI

```
clc
//
//
//

```

```
//Variable declaration
lambdaa=5086*10**-7                  //Wavelength
s=29.73                              //Specific rotation

//Calculations
delmu=((s*lambdaa)/180)*10**5

//Result
printf("\n The Difference in RI is %1.1f *10**-5",
   delmu)
```

Scilab code Exa 3.14 The Concentation of sugar solution

```
clc
//
//
//

//Variable declaration
theta1=13          //rotation of plane
l1=2                //length
l2=3                //Length
s=6.5               //Specific rotation

//Calculations
theta=s*l2*(1/3)

//Result
printf("\n The Concentration of sugar solution is
   %0.3f degree",theta)
```

Scilab code Exa 3.15 The Length will be

```
clc
//
//
//

//Variable declaration
theta1=35         //rotation of plane
s=100             //Specific rotation
c=0.1             //Concentration

//Calculations
l=((theta1)/(s*c))*10

//Result
printf("\n The Length will be %i cm",l)
```

Chapter 4

fiber optics and laser

Scilab code Exa 4.1 percentage of purity of sample

```
clc
//
//
//

//Variable declaration
theta1=9.9          //rotation of plane
l=2                 //Length
c=0.08              //Concentration
s2=66               //specific rotation

//Calculations
s1=((theta1)/(l*c))
pis=((s2-s1)/s2)*100
pps=100-pis


//Result
printf("\n percentage of purity of sample %0.3f
   percentage",pps)
```

Scilab code Exa 4.2 d The Numerical Apperture

```
clc
//
//
//

//Variable declaration
muclad=1.48    //Refractive index of claddings
mucore=1.5     //Refractive index of core

//Calculations
thetac=(180/%pi)*(asin(muclad/mucore))
fri=(mucore-muclad)/mucore
aa=(sqrt((mucore**2)-(muclad**2)))
NA=sin(aa)
//Result
printf("\n (a) The critical angle is :%2.2f degrees"
    ,thetac)
printf("\n (b) The Fractional refractive index is :
    %1.3f ",fri)

printf("\n (c) The Acceptance angle is :%1.3f
    Radians",aa)
printf("\n (d) The Numerical Apperture is :%1.3f ",
    NA)
```

Scilab code Exa 4.3 The number of modes

```
clc
//
//
```

```
//

//Variable declaration
a=25*10**-6                    //core radius
lambdaa=0.85*10**-6     //Wavelength
NA=0.22                 //Numerical Aperture

//Calculations
V=((2*3.14*a*0.22)/lambdaa)
N=((V**2)/4)

//Result
printf("\n (a) The V number is %2.2f ",V)

printf("\n (b) The number of modes are %3.2f ",N)
```

Scilab code Exa 4.4 The coherence length of the laser beam

```
clc
//
//
//

//Variable declaration
c=3*10**8
delf=3000     //Bandwidth

//Calculations
lc=(c/delf)

//Result
printf("\n The coherence length of the laser beam is %0.3f m or 10**5 m",lc)
```

Scilab code Exa 4.5 The transverse coherence length

```
clc
//
//
//

//Variable declaration
lambdaa=5*10**-5          //Wavelength
theta=32                  //Angle subtended by the sun
    at the slit

//Calculations
l=((lambdaa*60*180)/(theta*3.14))

//Result
printf("\n The transverse coherence length is %1.3f
   cm",l)
```

Chapter 6

simple harmonic motion

Scilab code Exa 6.1 The Degree of Monochromaticity

```
clc
//
//
//

//Variable declaration
lambdaa=5400*10**-10          //Wavelength
tc=10**-10                    //coherence time
c=3*10**-8

//Calculations
dom=((lambdaa)/(tc*c))*10**-10

//Result
printf("\n The Degree of Monochromaticity is %2.0f
    *10**-6",dom)
```

Scilab code Exa 6.2 The time taken to move from one end of its path

```
clc
//
//
//

//Variable declaration
W=(3.14/3)     //Angular frequency in radian



//Calculations
t=((3.14)/(3*W))

//Result
printf("\n The time taken to move from one end of
    its path to 0.025m from mean position is %i sec",
    t)
```

Scilab code Exa 6.3 The Maximum Velocity

```
clc
//
//
//

//Variable declaration
T=31.4              //Time Period
A=0.06              //Amplitude



//Calculations
W=((2*3.14)/T)
Vmax=W*A

//Result
```

```
printf("\n The Maximum Velocity is %0.3f m/sec",Vmax
    )
```

Scilab code Exa 6.5 The Time Period of Oscillation for the other body

```
clc
//
//
//

//Variable declaration
m=8             //mass
g=9.8           //acceleration due to gravity
x=0.32          //Stretched spring deviation
m2=0.5          //mass of the other body


//Calculations
k=((m*g)/x)
T=((2*3.14)*sqrt(m2/k))

//Result
printf("\n The Time Period of Oscillation for the
    other body is %0.2f sec",T)
```

Scilab code Exa 6.7 The Time in which the amplitude decreases

```
clc
//
//
//

//Variable declaration
```

```
Q=2000     //Quality Factor
f=240       //Frequency


//Calculations
Tau=((Q)/(2*3.14*f))
t=4*Tau

//Result
printf("\n The Time in which the amplitude decreases
    is %1.1f sec",t)
```

Chapter 7

dielectric

Scilab code Exa 7.1 The Value of A by Amax

```
clc
//
//
//

//Variable declaration
A=50/1.4   //Amplitude which is A=(50f/1.4*W**2)
Amax=50    //Max Amplitude which is Amax=(50f/W**2)


//Calculations
Rat=A/Amax

//Result
printf("\n The Value of A/Amax is %0.2f ",Rat)
```

Scilab code Exa 7.2 The Magnitude of E for a plane wave in free space

```
clc
//
//
//

//Variable declaration
E0=8.86*10**-12
mu0=4*3.14*10**-7
H=1

//Calculations
E=H*(sqrt(mu0/E0))

//Result
printf("\n The Magnitude of E for a plane wave in
    free space is %3.1f ",E)
```

Scilab code Exa 7.3 The Velocity of the wave

```
clc
//
//
//

//Variable declaration
mu0=4*3.14*10**-7
mur=1
Er=2
E0=8.86*10**-12
E01=5
c=3*10**8

//Calculations
Z=sqrt((mu0*mur)/(E0*Er))
H0=(E01/Z)*10
```

```
v=((c)/sqrt(mur*Er))*10**-8

//Result
printf("\n The Impedence of the Medium is %3.1f ",Z)

printf("\n The Peak Magnetic Field Intensity is %1.3
   f A/m",H0)
printf("\n The Velocity of the wave is %1.2f *10**8
   m/s",v)
```

Scilab code Exa 7.4 The Amplitude of the oscillating magnetic field

```
clc
//
//
//

//Variable declaration
c=3*10**8
f=3*10**11
E0=50

//Calculations
lambdaa=(c/f)
B0=(E0/c)*10**7

//Result
printf("\n The Wavelength is %0.3f m or 10**-3 m",
   lambdaa)
printf("\n The Amplitude of the oscillating magnetic
    field is %1.2f *10**-7 T",B0)
```

Scilab code Exa 7.5 The Average solar energy incident on earth

```
clc
//
//
//

//Variable declaration
R=1.5*10**11    //Average distance between sun &
    Earth
P=3.8*10**26    //Power Radiated by sun


//Calculations
S=((P*60)/(4*3.14*(R**2)*4.2*100))*10**-2

//Result
printf("\n The Average solar energy incident on
    earth is %1.2f cal/cm**2/min",S)
```

Scilab code Exa 7.6 The Amplitude of Magnetic field per turn

```
clc
//
//
//

//Variable declaration
S=2      //solar energy
EH=1400
Z=376.6

//Calculations
E=sqrt(EH*Z)
H=sqrt(EH/Z)
E0=E*sqrt(2)
H0=H*sqrt(2)
```

```
//Result
printf("\n The Amplitude of Electric field is %i V/m
    ",E0)
printf("\n The Amplitude of Magnetic field per turn
    is %1.2f A-turn/m",H0)
```

Scilab code Exa 7.7 The Intensity of Magnetic Field

```
clc
//
//
//

//Variable declaration
EH=(1000/(16*3.14))
Z=376.6

//Calculations
E=sqrt(EH*Z)
H=sqrt(EH/Z)

//Result
printf("\n The Intensity of Electric field is %2.2f
    V/m",E)
printf("\n The Intensity of Magnetic Field is %0.3f
    A-turn/m",H)
```

Scilab code Exa 7.9 The Characteristic Impedence

```
clc
//
//
```

```
//

//Variable declaration
C=70*10**-12      //Cable Capacitance
L=0.39*10**-6     //Cable Inductance

//Calculations
Z0=(sqrt(L/C))

//Result
printf("\n The Characteristic Impedence is %2.2f Ohm
    ",Z0)
```

Chapter 8

electromagnetic theory

Scilab code Exa 8.1 The Dielectric Constant of the insulation used

```
clc
//
//
//

//Variable declaration
VF=0.62   //Velocity Factor of coaxial Cable

//Calculations
Er=(1/(VF**2))

//Result
printf("\n The Dielectric Constant of the insulation
    used is %1.1f ",Er)
```

Scilab code Exa 8.2 The Dipole Moment induced in each Helium atom

```
clc
```

```
//
//
//

//Variable declaration
k=1.000074
E=100
E0=8.854*10**-12
n=0.268*10**26

//Calculations
p=(k-1)*E0*E
P=(p/n)*10**38

//Result
printf("\n The Dipole Moment induced in each Helium
    atom is %1.3f *10**-38 Coul-m",P)
```

Scilab code Exa 8.3 The Electrical Susceptibility

```
clc
//
//
//

//Variable declaration
k=1.000074
//Calculations
X=(k-1)

//Result
printf("\n The Electrical Susceptibility is %0.6f ",
    X)
```

Scilab code Exa 8.4 The Net Dipole Moment

```
clc
//
//
//

//Variable declaration
E=1*10**-4
D=5*10**-4
V=0.5
P=4*10**-4

//Calculations
Er=(D/E)
NDM=P*V

//Result
printf("\n (a) The Value of Er is %i ",Er)

printf("\n (b) The Net Dipole Moment is  %0.4f coul-m or 2*10**-4 coul-m",NDM)
```

Chapter 9

special theory of relativity

Scilab code Exa 9.1 The Energy Density

```
clc
//
//
//

//Variable declaration
k=3
E0=8.854*10**-12
E=10**6

//Calculations
P=(E0*(k-1)*E)*10**6
D=(E0*k*E)*10**6
Ed=0.5*E0*k*(E**2)

//Result
printf("\n (a) The Polarization in the Dielectric is
    %2.2f *10**-6 coul/m**2",P)
printf("\n (b) The Displacement Current Density is
   %2.2f *10**-6 coul/m**2",D)
printf("\n (c) The Energy Density is %0.3f J/m**3",
```

```
Ed)
```

Scilab code Exa 9.2 Change in length in diameter

```
clc
//
//
//

//Variable declaration
l=2*6371          //Diameter of earth
v=30              //velocity
c=3*10**5         //velocity of light

//Calculations
dell=(l*v**2)/(2*c**2)/10**-5

//Result
printf("\n Change in length in diameter= %0.2f *10**-2 m",dell)
```

Scilab code Exa 9.3 The minimum speed v

```
clc
//
//
//

//Variable declaration
delt=10                 //time duration at earth
delt1=1/365

//Calculations
```

```
v=sqrt(1-(delt1/delt)**2)

//Result
printf("\n The minimum speed v=  %0.3f c",v)
```

Scilab code Exa 9.4 The time taken on spaceship t1

```
clc
//
//
//

//Variable declaration
L0=20              //The distance of the star
v=0.95             //velocity

//Calculations
t=L0/v
L=L0*sqrt(1-v**2)
L=(L)

t1=(L*3*10**8)/(v*3*10**8)

//Result
printf("\n (1) The time taken on earth (t) =  %0.2f
   year",t)
printf("\n (2) The time taken on spaceship  (t1) =
   %0.2f year",t1)
```