

R Textbook Companion for  
A Textbook of Electrical Engineering Materials  
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# Book Description

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R 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)

For example, Exa 3.51 means solved example 3.51 of this book. Sec 2.3 means an R code whose theory is explained in Section 2.3 of the book.

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# List of R Codes

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# Chapter 2

## Conducting Materials

**R code Exa 2.1** Calculate the resistance

```
1 # Page No : 21
2
3 l = 300.0
4 a = 25*(10^-6)
5 d15 = 2.7
6 R15 = d15*(1/a)
7 print(R15)
8 k0 = 0.004
9 t = 15;
10 T = 50
11 k15 = k0/(1+(k0*t))
12 R50 = R15*(1+k15*(T-t))
13 print(R50)
14
15 # The answer provided in the textbook is wrong.
```

---

**R code Exa 2.2** Calculate the resistance



```

1 # Page No : 21
2
3 R20 = 400
4 k0 = 0.0038
5 t = 20
6 T = 80
7 k1 = k0 / (1 + (k0 * t))
8 R80 = R20 * (1 + k1 * (T - t))
9 print(R80)

```

---

**R code Exa 2.3** What will be the temprature

```

1 # Page no : 22
2
3 t = 15
4 R15 = 250
5 RT = 300.0
6 k0 = 0.0038
7 k1 = k0 / (1 + (k0 * t))
8 T = (((RT / R15) - 1) / k1) + t
9 print(T)

```

---

**R code Exa 2.4** Calculate length of a heater element

```

1 # Page NO : 22
2
3 d = 0.4 * (10^-3)
4 a = pi * (d^2) / 4
5 p1 = 100 * (10^-8)
6 R = 40
7 l1 = R * a / p1
8 print(l1)
9 d = 0.4 * (10^-3)

```

```

10 a  = 12.6*(10^-8)
11 p2 = 1.72*(10^-8)
12 R  = 40
13 l2 = R*a/p2
14 print(l2)
15
16 # The answer may slightly vary due to rounding off
    values.

```

---

**R code Exa 2.5** Find the resistance

```

1 # Page No : 23
2
3 R0  = 80
4 t   = 40
5 k0  = 0.0043
6 R40 = R0*(1+(k0*t))
7 print(R40)

```

---

**R code Exa 2.6** Find the temprature

```

1 # Page Number : 23
2
3 R80 = 50
4 R28 = 40
5 t   = 28
6 T   = 80
7 k28 = ((R80/R28)-1)/(T-t)
8 print(k28)
9 k0  = k28/(1-k28*t)
10 print(k0)

```

---

**R code Exa 2.7** Calculate the resistance

```
1 # Page Number : 24
2
3 l = 1000
4 d = 0.09/100
5 p = 1.724*(10^-8)
6 a = pi*(d^2)/4
7 R = p*l/a
8 print(R)
9
10 # The answer may slightly vary due to rounding off
    values.
```

---

**R code Exa 2.8** Calculate the resistance

```
1 # Page Number : 24
2
3 R20 = 50
4 T = 60
5 t = 20
6 k0 = 0.00427
7 R0 = R20/(1+(k0*t))
8 print(R0)
9 R60 = R0*(1+(k0*T))
10 print(R60)
```

---

**R code Exa 2.9** Find the resistivity

```

1 # Page Number : 24
2
3 k20 = 1/254.5
4 p0 = 1.6*(10^-6)
5 t = 20
6 T = 50
7 k0 = k20/(1-(t*k20))
8 p50 = p0*(1+(T*k0))
9 k50 = 1/(T+(1/k0))
10 print(k0)
11 print(p50)

```

---

**R code Exa 2.10** Determine the Temperature

```

1 # Page Number : 25
2
3 R15 = 50
4 RT = 58
5 t = 15
6 k0 = 0.00425
7 R0 = R15/(1+(k0*t))
8 T = ((RT/R0)-1)/k0
9 print(R0)
10 print(T)
11
12 # The answer may slightly vary due to rounding off
    values.

```

---

**R code Exa 2.11** Determine the Temperature

```

1 # Page Number : 25
2
3 R25 = 50

```

```

4 R70 = 57.2
5 t = 25
6 T = 70
7 k0 = (R70-R25)/((R25*T)-(R70*t))
8 print(k0 )

```

---

**R code Exa 2.12** Find its percentage conductivity

```

1 # Page Number : 26
2
3 R0 = 15.5
4 t = 16
5 k0 = 0.00428
6 R16 = R0*(1+(k0*t))
7 G = (R0/R16)*100
8 print(R16)
9 print(G)

```

---

**R code Exa 2.13** Find its temprature

```

1 # Page Number : 26
2
3 RT = 144
4 R20 = 10
5 t = 20
6 k20 = 5*(10^-3)
7 T = (((RT/R20)-1)/k20)+t
8 print(T)

```

---

**R code Exa 2.14** Find the mean temprature

```

1 # Page Number : 27
2
3 V15 = 250
4 Vt = 250
5 I15 = 5
6 It = 4
7 T = 15
8 R15 = V15/I15
9 print(R15)
10 Rt = Vt/It
11 print(Rt)
12 k0 = 0.0038
13 R0 = R15/(1+(k0*T))
14 print(R0)
15 t = ((Rt/R0)-1)/k0
16 print(t)

```

---

**R code Exa 2.15** Calculate the resistance

```

1 # Page Number : 28
2
3 n = 100
4 c = 12
5 Lm = 300
6 a = 1.5*0.2
7 s = 1.72*(10^-6)
8 p = 4
9 t = 20
10 T = 75
11 k0 = 0.00427
12 L = n*c*Lm
13 Ls = L/p
14 s0 = s*(1-(k0*t))
15 print(s0)
16 RT = (s0*Ls)/a

```

```
17 print(RT)
```

---

**R code Exa 2.16** Estimate its resistance

```
1 # Page Number : 28
2
3 a = 15
4 l = 100000
5 p0 = 7.6*(10^-6)
6 k0 = 0.005
7 t = 50
8 p50 = p0*(1+(t*k0))
9 R50 = p50*(l/a)
10 print(R50)
```

---

**R code Exa 2.17** Estimate the fusing

```
1 # Page Number : 29
2
3 I2 = 27.5
4 d = 1/2
5 I1 = I2*(d^(3/2))
6 print(I1)
```

---

**R code Exa 2.18** Compare the diameter

```
1 # Page Number : 30
2
3 sAl = 2.85*(10^-6)
4 sCu = 1.7*(10^-6)
```

```

5 gAl = 2.71
6 gCu = 8.89
7 cAl = 5000
8 cCu = 10000
9 Kd = sqrt(sAl/sCu)
10 print(Kd)
11 Km = (Kd^2)*(gAl/gCu)
12 print(Km)
13 Kc = Km*(cAl/cCu)
14 print(Kc)

```

---

**R code Exa 2.19** Find the resistance

```

1 # Page Number : 33
2
3 R1 = 18.6
4 K1 = 5
5 Ka = 3
6 R2 = R1*K1/Ka
7 print(R2)

```

---

**R code Exa 2.20** Determine the heat efficiency

```

1 # Page Number : 57
2
3 m = 1
4 S = 4200
5 T2 = 100
6 T1 = 15
7 H = m*S*(T2-T1)
8 print(H)
9 W = 500
10 t = 15*60

```



```
11 Hd = W*t
12 print(Hd)
13 He = (H/Hd)*100
14 print(He)
```

---

**R code Exa 2.21** What is the time taken

```
1 # Page Number : 58
2
3 m = 3.6
4 S = 4200
5 T2 = 95
6 T1 = 15
7 H = m*S*(T2-T1)
8 print(H)
9 e = 0.84
10 Ei = H/e
11 print(Ei)
12 W = 1000
13 t = (Ei/W)/60
14 print(t)
15
16 # The answer may slightly vary due to rounding off
    values.
```

---

# Chapter 4

## Insulating Materials

**R code Exa 4.1** Find the capacity of each condenser

```
1 # Page Number : 110
2 library(polynom)
3 p = polynomial(c(0.0048, -0.16, 1))
4 c1 = solve(p)[1]
5 print(c1)
6 c2 = 0.16-c1
7 print(c2)
```

---

**R code Exa 4.2** Calculate the capacitance

```
1 # Page Number : 110
2 n = 9;
3 Ko = 8.854*10^-12;
4 K = 5;
5 A = 12*10^-4;
6 d = 2*10^-4;
7 C = (n-1)*Ko*K*A/d
8 print(C);
```

9  
10 # The answer provided in the textbook is wrong.

---

**R code Exa 4.3** Find the heat produced

```
1 # Page Number : 110
2
3 C = 10^-6
4 V = 10000
5 E = 1/2*C*V^2
6 H = E/4.2
7 print(H)
```

---

**R code Exa 4.4** Calculate the dielectric constant

```
1 # Page Number : 111
2
3 A = 0.02;
4 d = 0.001;
5 C = 4.5*10^-10;
6 Ko = 8.854*10^-12;
7 K = (C*d)/(Ko*A)
8 V = 15000;
9 Q = C*V
10 D = Q/A
11 print(D)
```

---

**R code Exa 4.5** Find K2

```
1 # Page Number : 111
```

```

2
3 d = 0.003;
4 K1 = 6;
5 Ko = 8.854*10^-12;
6 d1 = 0.003;
7 d2 = 0.005;
8 K2 = (d2*K1)/(3*d-d1)
9 print(K2)

```

---

**R code Exa 4.6** Determine the force

```

1 # Page Number : 113
2
3 q1 = 1;
4 q2 = 1;
5 Eo = 8.854*10^-12;
6 Er = 1;
7 d = 1
8 pi = 3.14;
9 F = (q1*q2)/(4*pi*Eo*Er*d^2)
10 print(F)
11
12 # The answer may slightly vary due to rounding off
    values.

```

---

**R code Exa 4.7** Find the charge on each

```

1 # Page Number : 114
2
3 pi = 3.14;
4 d = 0.2;
5 K = 9*10^9;
6 F = 9.81*10^-1;

```

```
7 q = sqrt((F*(d^2))/K)
8 print(q)
```

---

# Chapter 5

## Dielectric Materials

**R code Exa 5.1** Calculate its charge and capacity

```
1 # Page Number : 193
2
3 t = 0.25
4 I = 0.22
5 V = 220
6 Q = I*t
7 C = Q/V
8 C1 = C*(10^6)
9 print(Q)
10 print(C)
11 print(C1)
```

---

**R code Exa 5.2** Calculate the charge on each plate

```
1 # Page Number : 193
2
3 C = 0.0002*(10^-6)
4 V = 20000
```

```

5 t = 2
6 Q = C*V
7 g = (V/t)*(1/1000)
8 print(Q)
9 print(g)

```

---

**R code Exa 5.3** Find the energy stored

```

1 # Page Number : 194
2
3 C = 0.005*(10^-6)
4 V = 500
5 q = C*V
6 E = (1/2)*(C*V*V)
7 print(q)
8 print(E)
9 K = 2.5
10 q1 = q
11 C1 = K*C
12 E1 = (q1^2)/(2*C1)
13 print(E1)

```

---

**R code Exa 5.4** Calculate the dielectric constant

```

1 # Page Number : 194
2
3 A = 0.02
4 d = 0.001
5 C = 4.5*(10^-10)
6 V = 15000
7 K0 = 8.854*(10^-12)
8 K = (C*d)/(K0*A)
9 q = C*V

```

```
10 D = q/A
11 print(K)
12 print(D)
```

---

**R code Exa 5.5** Calculate the capacitance

```
1 # Page Number : 195
2
3 A = 0.2
4 t = 2.5*(10^-5)
5 K0 = 8.854*(10^-12)
6 K = 5
7 C = (K*K0*A*(10^6))/t
8 print(C)
```

---



# Chapter 6

## Magnetic Materials

**R code Exa 6.1** Determine the current required

```
1 # Page Number : 212
2
3 f = 0.01
4 l = 1
5 N = 1000
6 Ur = 1000
7 Uo = 4*pi*(10^-7)
8 a = 0.001
9 I = (f*l)/(N*Uo*Ur*a)
10 print(I)
```

---

**R code Exa 6.2** Find the relative permeability

```
1 # Page Number : 212
2
3 f = 1.2*(10^-3)
4 l = 1.4
5 N = 500
```

```

6 Uo = 4*pi*(10^-7)
7 a = 0.0012
8 I = 2
9 Ur = (f*l)/(N*I*Uo*a)
10 print(Ur)

```

---

**R code Exa 6.3** Determine the flux Density

```

1 # Page Number : 213
2
3 l = 0.4
4 N = 200
5 Uo = 4*pi*(10^-7)
6 a = 5*(10^-4)
7 I = 6.4
8 f = 0.8*(10^-3)
9 fd = f/a
10 fi = I*N/l
11 Ur = (f*l)/(N*I*Uo*a)
12 print(fd)
13 print(fi)
14 print(Ur)
15
16 # The answer provided in the textbook is wrong.

```

---

**R code Exa 6.4** Calculate the energy lost

```

1 # Page Number : 214
2
3 H1 = 250
4 V = 1/150
5 N = 50
6 E = H1*V*N

```

```
7 Eh = (E*3600)/1000
8 print(Eh)
```

---

**R code Exa 6.5** Determine the core loss

```
1 # Page Number : 214
2
3 P = 4
4 N = 1600
5 f = P*N/120
6 V = 5400
7 d = 7.5
8 m = (V*d)/1000
9 L = 1.76
10 Cl = L*m
11 print(f)
12 print(Cl)
```

---

**R code Exa 6.6** Determine the core loss

```
1 # Page Number : 214
2
3 v = 76300
4 P = 8
5 N = 375
6 f = P*N/120
7 Bmax = 12000
8 n = 0.002
9 d = 7.8
10 l = 1.7
11 Hl = n*v*f*(Bmax^1.6)*(10^-7)
12 Al = v*d*l/1000
13 Tl = Hl+Al
```

```
14 print(T1)
```

---

**R code Exa 6.7** Find the loss of energy

```
1 # Page Number : 215
2
3 m = 12000
4 d = 7.5
5 H1 = 3000
6 N = 50
7 v = m/d
8 E = v*H1*N
9 Eh = E/(10^10)
10 print(Eh)
```

---

**R code Exa 6.8** Separate the loss

```
1 # Page Number : 215
2
3 m = 10
4 T1 = 20
5 f1 = 50
6 T2 = 35
7 f2 = 75
8 c2 = (T2-(T1*f2/f1))/(f2^2-f1*f2)
9 c1 = (T1-c2*f1^2)/f1
10 k = c1/c2
11 H50 = T1*k/101
12 E50 = T1-H50
13 print(H50)
14 print(E50)
```

---

# Chapter 15

## Miscellaneous Solved Numerical Problems

**R code Exa 15.1** Calculate the Consumer voltage

```
1 # Page Number : 392
2
3 R = 0.2
4 I = 200
5 t = 100
6 V = 240
7 c = 0.8
8 V1 = I*R
9 Vc = V-V1
10 P = I*I*R
11 E = P*t/1000
12 C = E*c
13 print(Vc)
14 print(C)
```

---

**R code Exa 15.2** Find the resistance

```

1 # Page Number : 393
2
3 Vi = 220
4 Vo = 200
5 I = 40
6 Pi = Vi*I
7 Po = Vo*I
8 L = Pi-Po
9 R = L/(I^2)
10 t = 10
11 N = (Po*t)/1000
12 Nw = (L*t)/1000
13 print(R)
14 print(N)
15 print(Nw)

```

---

**R code Exa 15.3** Calculate the current drawn

```

1 # Page Number : 393
2
3 M = 250000
4 h = 50
5 g = 9.81
6 WD = M*h*g
7 P = WD/3600
8 V = 500
9 Ep = 0.8
10 Em = 0.9
11 E = Em*Ep
12 I = P/(V*E)
13 print(I)

```

---

**R code Exa 15.4** Calculate the torque

```

1 # Page Number : 394
2
3 P = 10
4 N = 600
5 a = 75
6 b = 735.5
7 Tkgm = (P*a*60)/(2*pi*N)
8 TNwm = (P*b*60)/(2*pi*N)
9 print(Tkgm)
10 print(TNwm)

```

---

**R code Exa 15.5** Calculate the mass of oil

```

1 # Page Number : 395
2
3 P = 25
4 s = 12500
5 e = 0.35
6 P1 = P/e
7 P2 = P1*860
8 m = P2/s
9 w = 1000
10 Eg = (P*w)/m
11 print(m)
12 print(Eg)

```

---

**R code Exa 15.10** Determine the resistance

```

1 # Page Number : 398
2
3 rho = 1.7*(10^-6)
4 l = 5
5 t = 0.005

```

```

6 D = 0.08
7 d = D-(2*t)
8 a = pi*(D^2-d^2)/4
9 R = rho*l/a
10 R1 = R/(10^-4)
11 print(R1)

```

---

**R code Exa 15.11** Determine the conductivity

```

1 # Page Number : 399
2
3 rho = 1.7*(10^-8)
4 K = 1/rho
5 a = 0.125*(10^-4)
6 l = 2000
7 G = K*a/l
8 print(K)
9 print(G)

```

---

**R code Exa 15.12** Determine the resistivity

```

1 # Page Number : 399
2
3 V = 0.05
4 l = 300
5 R = 0.0306
6 rho = R*V/(l^2)
7 print(rho)

```

---

**R code Exa 15.13** Calculate the value



```

1 # Page Number : 400
2
3 rho = 0.67*(10^-6)
4 m = 39.4
5 m2 = 1525
6 rhoc = rho*m/m2
7 rho1 = rhoc/(10^-6)
8 print(rhoc)
9 print(rho1)

```

---

**R code Exa 15.14** What is the resistance of new wire

```

1 # Page Number : 400
2
3 R1 = 0.12
4 d1 = 15
5 d2 = 0.4*d1
6 a1 = pi*(d1^2)/4
7 a2 = pi*(d2^2)/4
8 R2 = R1*((a1/a2)^2)
9 print(R2)

```

---

**R code Exa 15.15** what will be the resistance

```

1 # Page Number : 401
2
3 lab = 10
4 Aab = 1/2
5 RH0ab = 1/2
6 Ra = 2
7 Rb = (Ra*Aab)/(lab*RH0ab)
8 print(Rb)

```

---

**R code Exa 15.16** what will be the resistance

```
1 # Page Number : 402
2 RH0o = 10.3*(10^-6)
3 d = 0.0074
4 a = pi*(d^2)/4
5 Ro = 4
6 l = Ro*a/RH0o
7 alphao = 0.0038
8 t = 100
9 R100 = Ro*(1+(alphao*t))
10 print(l)
11 print(R100)
12
13 # The answer provided in the textbook is wrong.
```

---

**R code Exa 15.17** What is the resistance

```
1 # Page Number : 403
2
3 Ra = 1
4 lab = 20
5 Aab = 1/3
6 Rb = Ra*(Aab/lab)
7 print(Rb)
```

---

**R code Exa 15.19** Obtain the potential Difference

```
1 # Page Number : 405
```

```

2
3 I1 = 2/(2+3)
4 Vbe = 3*I1
5 I2 = 4/(5+3)
6 Vaf = 3*I2
7 V = Vbe+4-Vaf
8 print(V)

```

---

**R code Exa 15.20** Find the current

```

1 # Page Number : 405
2 a = matrix(c(1,-1,25,15), nrow=2, byrow=TRUE)
3 b = c(20,1950)
4 I = solve(a,b)[2]
5 print(I)

```

---

**R code Exa 15.21** Determine the herstesis power

```

1 # Page Number : 407
2
3 A = 30
4 s1 = 0.4
5 s2 = 400
6 V = 1.2*(10^-3)
7 f = 50
8 H = A*s1*s2
9 Hp = H*V*f
10 print(Hp)

```

---

**R code Exa 15.22** Find the loss of energy

```

1 # Page Number : 407
2
3 d = 7500
4 w = 12
5 V = w/d
6 f = 25
7 N = 3600*f
8 A = 300
9 E = A*V*N
10 print(E)

```

---

**R code Exa 15.23** Find the inductance

```

1 # Page Number : 407
2
3 l = 0.5
4 d = 0.1
5 N = 1500
6 a = pi*(d^2)/4
7 Ur = 1
8 Uo = 4*pi*(10^-7)
9 I = 8
10 L = ((N^2)*a*Uo*Ur)/l
11 E = (1/2)*L*(I^2)
12 print(L)
13 print(E)
14
15 # The answer may slightly vary due to rounding off
    values.

```

---

**R code Exa 15.24** Calculate the flux passing

```

1 # Page Number : 408

```

```

2
3 N = 600
4 I = 2
5 l = 0.6
6 H = N*I/l
7 Ur = 1
8 Uo = 4*pi*(10^-7)
9 d = 0.025
10 a = pi*(d^2)/4
11 phi = Uo*Ur*H*a
12 print(H)
13 print(phi)

```

---

**R code Exa 15.25** Calculate the ampere turns

```

1 # Page Number : 408
2
3 Ur = 1
4 B = 1.257
5 Uo = 4*pi*(10^-7)
6 H = B/(Uo*Ur)
7 l = 0.004
8 AT = H*l
9 print(AT)
10
11 # The answer may slightly vary due to rounding off
    values.

```

---

**R code Exa 15.26** What is the flux through it

```

1 # Page Number : 409
2
3 D = 0.3

```

```

4 l = pi*D
5 N = 400
6 a = 0.0012
7 Ur = 1000
8 Uo = 4*pi*(10^-7)
9 I = 2
10 phi = (N*I)/(l/(Uo*Ur*a))
11 phi1 = phi/(10^-3)
12 print(phi1)

```

---

**R code Exa 15.27** Calculate the magnetising current

```

1 # Page Number : 409
2
3 a = 0.01
4 Uo = 4*(pi)*(10^-7)
5 lf = 1.25
6 Ur = 400
7 N = 175
8 phig = 0.8*(10^-3)
9 Bg = phig/a
10 Hg = Bg/Uo
11 Lg = 0.004
12 ATg = Hg*Lg
13 phii = phig*lf
14 Bi = phii/a
15 Hi = Bi/(Uo*Ur)
16 Li = 1.5
17 ATi = Hi*Li
18 AT = ATi+ATg
19 I = ATg/N
20 print(I)

```

---

**R code Exa 15.28** Calculate its charge and capacity

```
1 # Page Number : 411
2
3 SI = 0.2
4 t = 0.2
5 Q = SI*t
6 V = 220
7 C = Q/V
8 C1 = C*(10^6)
9 print(Q)
10 print(C1)
```

---

**R code Exa 15.29** Find the heat produced

```
1 # Page Number : 411
2
3 C = 2*(10^-6)
4 V = 10000
5 E = (1/2)*C*(V^2)
6 H = E/4.2
7 print(H)
```

---

**R code Exa 15.30** Calculate the dielectric constant

```
1 # Page Number : 411
2
3 V = 15*(10^3)
4 A = 0.02
5 d = 0.001
6 C = 4.5*(10^-10)
7 Ko = 8.854*(10^-12)
8 K = (C*d)/(Ko*A)
```

```
9 q = C*V
10 D = q/A
11 print(q)
12 print(D)
```

---

**R code Exa 15.31** Calculate the resistance

```
1 # Page Number : 412
2
3 m = 0.6
4 S = 4200
5 T1 = 100
6 T2 = 10
7 t = 5*60
8 V = 230
9 H = m*S*(T1-T2)
10 e = 0.78
11 Ei = H/e
12 Ei1 = Ei/(100*3600)
13 W = Ei/t
14 R = (V*V)/W
15 print(R)
```

---

**R code Exa 15.32** How long will it take

```
1 # Page Number : 413
2
3 m1 = 120
4 m2 = 20
5 S1 = 1
6 S2 = 0.095
7 T1 = 10
8 T2 = 60
```



```

9 H = (m1*S1*(T2-T1))+(m2*S2*(T2-T1))
10 H1 = H*4200
11 e = 0.8
12 E = H1/e
13 E1 = E/(1000*3600)
14 r = 3
15 t = E1/r
16 print(t)

```

---

**R code Exa 15.33** Determine the frequency of supply

```

1 # Page Number : 414
2
3 rho = 5*(10^-5)
4 U = 1
5 d = 0.15
6 f = (rho*(10^9))/(U*d*d*4*(pi^2))
7 f1 = f/1000
8 print(f1)

```

---

**R code Exa 15.34** Determine the power required

```

1 # Page Number : 414
2
3 v = 50*20*2
4 Mw = 0.56
5 m = Mw*v/1000
6 S = 0.35
7 t = 15/60
8 f = 30*(10^6)
9 t2 = 150
10 t1 = 30
11 H = m*S*(t2-t1)

```

```

12 Hw = H*1000/860
13 P = Hw/t
14 e = 0.5
15 Pi = P/e
16 Ko = 8.854*(10^-12)
17 K = 5
18 A = 0.5*0.2
19 i = 0.02
20 C = Ko*K*A/i
21 Xc = 1/(2*pi*f*C)
22 cosx = 0.05
23 tanx = 19.97
24 R = Xc*tanx
25 V = sqrt(Pi*R)
26 Ic = V/Xc
27 print(Pi)
28 print(V)
29 print(Ic)

```

---

**R code Exa 15.35** Estimate the efficiency

```

1 # Page Number : 416
2
3 m = 2
4 t1 = 15
5 t2 = 660
6 S = 0.212
7 L = 78.8
8 H = (m*S*(t2-t1))+(m*L)
9 i = 5
10 E = i*(1000*10*60)
11 E1 = E/4180
12 e = H*100/E1
13 print(e)
14

```

```
15 # The answer may slightly vary due to rounding off
    values.
```

---

**R code Exa 15.36** Find the cost of using the motor

```
1 # Page Number : 417
2
3 O = 5*735.5
4 e = 0.85
5 c = 2
6 I = O/e
7 t = 4
8 E = I*t/1000
9 C = c*E
10 print(C)
11
12 # The answer may slightly vary due to rounding off
    values.
```

---

**R code Exa 15.37** How many electrons pass through

```
1 # Page Number : 417
2
3 I = 2.5*(10^-3)
4 t = 30*(10^-3)
5 Q = I*t
6 e = 1.602*(10^-19)
7 N = Q/e
8 print(N)
```

---

**R code Exa 15.38** Find the resistance

```
1 # Page Number : 417
2
3 l = 1
4 a = 2.5*(10^-2)*0.05*(10^-2)
5 rho = 1.724*(10^-8)
6 R = rho*l/a
7 l1 = 0.05*(10^-2)
8 a1 = 2.5*(10^-2)*1
9 R1 = rho*l1/a1
10 print(R)
11 print(R1)
```

---

**R code Exa 15.39** Calculate the resistance

```
1 # Page Number : 418
2
3 m = 2
4 t2 = 98
5 t1 = 15
6 s = 1
7 V = 200
8 H = m*s*(t2-t1)
9 H1 = H*4200
10 e = 0.85
11 E = H1/e
12 E1 = E/(1000*3600)
13 c = 35
14 C = c*E1
15 t = 10/60
16 W = E1*1000/t
17 R = V*V/W
18 print(R)
19 print(C)
```

20

21 # The answer may slightly vary due to rounding off  
values.

---

**R code Exa 15.40** Calculate the value of exciting current

```
1 # Page Number : 418
2
3 phi = 70000/(10^8)
4 d = 0.03
5 a = pi*d*d/4
6 B = phi/a
7 Lg = 0.002
8 Ls = (pi*0.2)-Lg
9 Uo = 4*pi*(10^-7)
10 Ur = 800
11 Hg = B/Uo
12 Hs = B/(Uo*Ur)
13 AT = (Hg*Lg)+(Hs*Ls)
14 N = 500
15 I = AT/N
16 print(I)
```

---