

Scilab Textbook Companion for
Engineering Economics
by R. Panneerselvam¹

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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

Introduction

Scilab code Exa 1.1 Break even sales quantity margin of safety

```
1 //Exa1.1
2 clc;
3 clear;
4 close;
5 //given data :
6 FC=2000000; //in Rs
7 v=100; //in Rs
8 s=200; //in Rs
9 Q=60000; //in units
10 //Part a : Break even quantity
11 BEQ=FC/(s-v); //in units
12 disp(BEQ,"Break even quantity in units : ");
13 //Part b : Break even sales
14 BES=FC*s/(s-v); //in Rs
15 disp(BES,"Break even sales in Rs. : ");
16 //Part c : Contribution & margin of safety
17 Con=s*Q-v*Q; //in Rs
18 disp(Con,"Contribution in units : ");
19 Mos=Q*s-BES; //in Rs
20 disp(Mos,"Margin of safety in Rs. : ");
```

Scilab code Exa 1.2 Find contribution profit BEP MS

```
1 //Exa1.2
2 clc;
3 clear;
4 close;
5 //given data :
6 FC=25000;//in Rs
7 v=45000;//in Rs
8 s=120000;//in Rs
9 //Part a : Contribution
10 Con=s-v;//in Rs
11 disp(Con,"Contribution in Rs : ");
12 //Part b : Profit
13 Prof=Con-FC;//in Rs
14 disp(Prof,"Profit in Rs : ");
15 //Part c : BEP
16 PVratio=Con*100/s;//in %
17 BEP=FC*100/PVratio;//in Rs
18 disp(BEP,"BEP in Rs : ");
19 //Part d : M.S.
20 MS=Prof*100/PVratio;//in Rs
21 disp(MS,"M.S. in Rs : ");
```

Scilab code Exa 1.3 Find contribution profit BEP MS

```
1 //Exa1.3
2 clc;
3 clear;
4 close;
5 //given data :
6 FC=15000;//in Rs
```

```
7 v=35000;//in Rs
8 s=80000;//in Rs
9 //Part a : Contribution
10 Con=s-v;//in Rs
11 disp(Con,"Contribution in Rs : ");
12 //Part b : Profit
13 Prof=Con-FC;//in Rs
14 disp(Prof,"Profit in Rs : ");
15 //Part c : BEP
16 PVratio=Con*100/s;//in %
17 BEP=FC*100/PVratio;//in Rs
18 disp(round(BEP),"BEP in Rs : ");
19 //Part d : M.S.
20 MS=Prof*100/PVratio;//in Rs
21 disp(round(MS),"M.S. in Rs : ");
```

Chapter 2

Elementary Economic Analysis

Scilab code Exa 2.1 Find Economic advantage

```
1 //Exa2.1
2 clc;
3 clear;
4 close;
5 //Part a : Cost of using aluminium metal for the jet
   engine part
6 //given data :
7 w1=1.2;//in Kg
8 //let c1=cost of making aluminium casting
9 //let c2=cost of machining aluminium casting per
   unit
10 //let Tc=Total cost of jet engine part made of
   aluminium per unit
11 c1=80;//in Rs/Kg
12 c2=150;//in Rs
13 Tc1=c1*w1+c2;//in Rs
14 disp(Tc1,"Total cost of jet engine part made of
   aluminium per unit in Rs : ");
15
16 //Part b : Cost of jet engine part made of steel/
   unit
```

```

17 //given data :
18 w2=1.35;//in Kg
19 //let c1=cost of making steel casting
20 //let c2=cost of machining steel casting per unit
21 //let c3=penalty of excess weight of steel casting
22 //let Tc=Total cost of jet engine part made of steel
    per unit
23 c1=35;//in Rs/Kg
24 c2=170;//in Rs
25 c3=1300;//in Rs/Kg
26 Tc2=c1*w2+c2+c3*(w2-w1);//in Rs
27 disp(Tc2,"Total cost of jet engine part made of
    steel per unit in Rs : ");
28 disp(Tc2-Tc1,"DECISION : The total cost/unit of a
    jet engine part made of aluminium is less than
    that for an engine made of steel. Hence,
    aluminium is suggested for making jet engine part
    . The economic advantage of aluminium over steel
    per unit in Rs : ")

```

Scilab code Exa 2.2 Select best alternative and Find Economic advantage

```

1 //Exa2.2
2 clc;
3 clear;
4 close;
5 //given data for table with wooden top
6 wood=0.1;//in m^3
7 WoodCost=12000;//in Rs/m^3
8 Table=1;//in units
9 TableTopCost=3000;//in Rs/unit
10 LegBushes=4;//units
11 LegBushesCost=10;//Rs/units
12 Nails=100;//in grams
13 NailsCost=300;//in Rs/Kg

```

```

14 TotalLabour=15;//in Hours
15 TotalLabourCost=50;//in Rs/Hours
16 //Part a : Cost of table with wooden top
17 WoodCostframelegs=WoodCost*wood;//in Rs
18 WoodTopCost=3000;//in Rs
19 BushesCost=LegBushesCost*LegBushes;//in Rs
20 NailsCost=Nails*NailsCost/1000;//in Rs
21 LabourCost=TotalLabourCost*TotalLabour;//in Rs
22 TotalCost1=WoodCostframelegs+WoodTopCost+BushesCost+
    NailsCost+LabourCost;//in Rs
23 disp(TotalCost1,"Cost of Table with wooden top in Rs
    : ");
24
25 //given data for table with granite top
26 wood=0.15;//in m^3
27 WoodCost=12000;//in Rs/m^3
28 Granite=1.62;//in m^2
29 GraniteCost=800;//in Rs/m^2
30 LegBushes=4;//units
31 LegBushesCost=25;//Rs/units
32 Nails=50;//in grams
33 NailsCost=300;//in Rs/Kg
34 TotalLabour=8;//in Hours
35 TotalLabourCost=50;//in Rs/Hours
36 //Part b : Cost of table with granite top
37 WoodCostframelegs=WoodCost*wood;//in Rs
38 GraniteTopCost=Granite*GraniteCost;//in Rs
39 BushesCost=LegBushesCost*LegBushes;//in Rs
40 NailsCost=Nails*NailsCost/1000;//in Rs
41 LabourCost=TotalLabourCost*TotalLabour;//in Rs
42 TotalCost2=WoodCostframelegs+GraniteTopCost+
    BushesCost+NailsCost+LabourCost;//in Rs
43 disp(TotalCost2,"Cost of Table with Granite top in
    Rs : ");
44 //Economic Advantage
45 disp(TotalCost1-TotalCost2,"Economic advantage of
    table with granite top in Rs : ")

```

Scilab code Exa 2.3 Find Economic advantage of best alternative

```
1 //Exa2.3
2 clc;
3 clear;
4 close;
5 //given data
6 LatheCost=200; //in Rs/hour
7 grinderCost=150; //in Rs/hour
8 //given data for Design A
9 HoursOfLathe=16; //in hours/1000 Unit
10 HoursOfGrinder=4.5; //in hours/1000 Unit
11 TotalCostA=LatheCost*HoursOfLathe+grinderCost*
    HoursOfGrinder; //in Rs/1000 unit
12 disp(TotalCostA*100000/1000, "Total cost of design A
    per 100,000 units : ");
13
14 //given data for Design B
15 HoursOfLathe=7; //in hours/1000 Unit
16 HoursOfGrinder=12; //in hours/1000 Unit
17 TotalCostB=LatheCost*HoursOfLathe+grinderCost*
    HoursOfGrinder; //in Rs/1000 unit
18 disp(TotalCostB*100000/1000, "Total cost of design A
    per 100,000 units : ");
19 //Economic Advantage
20 disp(TotalCostA*100-TotalCostB*100, "Economic
    advantage of design B over design A per 100,000
    units in Rs : ");
```

Scilab code Exa 2.4 Find optimum tank dimensions and total expected savings

```

1 //Exa2.4
2 clc;
3 clear;
4 close;
5 //given data for original design
6 Tanks=4;//units
7 TankDia=5.2;//in meter
8 TankRad=TankDia/2;//in meters
9 TankHeight=7;//in meters
10 HeightDiaRatio=TankHeight/TankDia;//unitless
11 VolPerTank=(22/7)*TankRad^2*TankHeight;//in m^3
12 //given data for new design
13 disp("Cost of old design = 111% of cost of new
      design(Optimal Design)");
14 disp("Optimal Ratio of height to diameter = 4:1 ");
15 disp("h:d = 4:1");
16 disp("4*d = h");
17 disp("r = h/8");
18 disp("Since volume remains the same, Volume = (22/7)
      *(h/8)^2*h");
19 h=VolPerTank/(22/7)*64;//in meters
20 r=h/8;//in meters
21 d=2*r;//in meters
22 CostNewDesign=900000*(100/111);//in Rs
23 disp(900000-CostNewDesign,"Expected savings by
      redesign in Rs : ");

```

Scilab code Exa 2.5 Find Economic advantage of selection

```

1 //Exa2.5
2 clc;
3 clear;
4 close;
5 distance=2500;//in Km
6 TransCost=1;//in Rs/Kg/100Km

```

```

7 //given data for steel window frame
8 SteelFramePrice=1000;//in Rs/Unit
9 SteelFrameWeight=75;//in Kg/Unit
10 TotalCost1=SteelFramePrice+TransCost*
    SteelFrameWeight*distance/100;//in Rs
11 disp(TotalCost1,"Total cost of steel window frame
    per unit in Rs : ");
12
13 //given data for Aluminium window frame
14 AlumilniumFramePrice=1500;//in Rs/Unit
15 AlumilniumFrameWeight=28;//in Kg/Unit
16 TotalCost2=AlumilniumFramePrice+TransCost*
    AlumilniumFrameWeight*distance/100;//in Rs
17 disp(TotalCost2,"Total cost of Alumilnium window
    frame per unit in Rs : ");
18 disp(TotalCost1-TotalCost2,"DECISION : The total
    cost per unit of the aluminium window frame is
    less than that of steel window frame. Hence,
    Alumilnium window frame is recommended. The
    Economic advantage per unit of the Alumilnium
    window frame over steel window frame in Rs : ")

```

Scilab code Exa 2.6 Find most economical sequence of operations

```

1 //Exa2.6
2 clc;
3 clear;
4 close;
5 //Cost of component using process sequence 1
6 disp("The process sequence 1 of the component is as
    follows : Turning – Milling – Shaping – Drilling"
    );
7 disp("Calculations are summarized in form of table
    below : ");
8 disp("Operation      Operation      Time

```



```

Machine Hour rate      Cost");
9  disp("  No.          Min    Hour
      Rs.            Rs.")");
10 disp("  1          Turning    5    0.083
      200          16.60");");
11 disp("  2          Milling     8    0.133
      400          53.20");");
12 disp("  3          Shapiing    10   0.167
      350          58.45");");
13 disp("  4          Drilling     3    0.050
      300          15.00");");
14 disp("
      Total      143.25");");
15
16 //Cost of component using process sequence 2
17 disp("The process sequence 2 of the component is as
      follows : Turning – Milling – Drilling");");
18 disp("Calculations are summarized in form of table
      below : ");");
19 disp("Operation      Operation      Time
      Machine Hour rate      Cost");");
20 disp("  No.          Min    Hour
      Rs.            Rs.")");
21 disp("  1          Turning    5    0.083
      200          16.60");");
22 disp("  2          Milling    14   0.233
      400          93.20");");
23 disp("  4          Drilling     3    0.050
      300          15.00");");
24 disp("
      Total      124.80");");
25
26 //Cost of component using process sequence 3
27 disp("The process sequence 3 of the component is as
      follows : Only CNC operations");");
28 disp("Calculations are summarized in form of table

```

```

    below : ");
29 disp(" Operation      Operation      Time
    Machine Hour rate      Cost");
30 disp("  No.           Min      Hour
    Rs.              Rs.");
31 disp("    1           CNC        8    0.133
    1000              133");
32
33 disp("The process sequence 2 has the least cost.
    Therefore, it should be selected for
    manufacturing the component.")

```

Chapter 3

Interest Formulas and their Applications

Scilab code Exa 3.1 Find maturity value

```
1 //Exa3_1
2 clc;
3 clear;
4 close;
5 //given data is :
6 P=20000;//in rupees
7 n=10;//in years
8 i=18;//% per annum
9 F=P*(1+i/100)^n;
10 disp("Maturity value after 18 years is : "+string(F)
      +" Rupees.");
11 //Note : Ans in the book is not correct.
```

Scilab code Exa 3.2 What is the single payment

```
1 //Exa3_2
```

```

2  clc;
3  clear;
4  close;
5  //given data is :
6  F=100000; //in rupees
7  n=10; //in years
8  i=15; //% per annum
9  P=F/(1+i/100)^n;
10 disp("The person has to invest : "+string(P)+"
      Rupees.");
11 //Note : Ans in the book is not correct.

```

Scilab code Exa 3.3 Find maturity value

```

1  //Exa3_3
2  clc;
3  clear;
4  close;
5  //given data is :
6  A=10000; //in rupees
7  n=25; //in years
8  i=20; //% per annum
9  F=A*((1+i/100)^n-1)/(i/100);
10 disp("The future sum of the annual equal payment
      after 25 years is : "+string(F)+" Rupees.");

```

Scilab code Exa 3.4 Find Equivalent Amount

```

1  //Exa3_4
2  clc;
3  clear;
4  close;
5  //given data is :

```

```

6 F=500000; //in rupees
7 n=15; //in years
8 i=18; //% per annum
9 A=F*((i/100)/((1+i/100)^n-1));
10 disp("The annual equal ammount which must be
    deposited for 15 years is : "+string(A)+" Rupees.
    ");

```

Scilab code Exa 3.5 Find single payment

```

1 //Exa3_5
2 clc;
3 clear;
4 close;
5 //given data is :
6 A=1000000; //in rupees
7 n=20; //in years
8 i=15; //% per annum
9 P=A*((1+i/100)^n-1)/((i/100)*(1+i/100)^n));
10 disp("The amount of reserve which must be setup now
    is : "+string(P)+" Rupees.");
11 //Note : Ans in the book is not correct.

```

Scilab code Exa 3.6 Find the installment amount

```

1 //Exa3_6
2 clc;
3 clear;
4 close;
5 //given data is :
6 P=1000000; //in rupees
7 n=15; //in years
8 i=18; //% per annum

```

```

9 A=P*((i/100)*(1+i/100)^n)/((1+i/100)^n-1));
10 disp("The annual equivalent installment to be paid
    by the company to the bank is : "+string(A)+"
    Rupees.");

```

Scilab code Exa 3.7 Find Total Amount of series

```

1 //Exa3_7
2 clc;
3 clear;
4 close;
5 //given data is :
6 A1=4000;//in rupees
7 G=500;//in rupees
8 n=10;//in years
9 i=15;//% per annum
10 A=A1+G*((1+i/100)^n-(i/100)*n-1)/((i/100)*(1+i/100)
    ^n-(i/100));
11 F=A*((1+i/100)^n-1)/(i/100);
12 disp("At the end of 10th year, the compound amount
    of all his payments will be : "+string(F)+"
    Rupees.");

```

Scilab code Exa 3.8 Find Total Amount of series

```

1 //Exa3_8
2 clc;
3 clear;
4 close;
5 //given data is :
6 A1=8500;//in rupees
7 G=-500;//in rupees
8 n=10;//in years

```

```

9 i=15; // % per annum
10 A=A1+G*((((1+i/100)^n-(i/100)*n-1)/((i/100)*(1+i/100)
    ^n-(i/100)));
11 F=A*((((1+i/100)^n-1)/(i/100));
12 disp("At the end of 10th year, the compound amount
    of all his payments will be : "+string(F)+"
    Rupees.");

```

Scilab code Exa 3.9 Find maturity amount

```

1 // Exa3_9
2 clc;
3 clear;
4 close;
5 // given data is :
6 P=5000; // in rupees
7 n=10; // in years
8 i=12; // % per annum
9 m=4; // no. of interest periods per year for quarterly
10 N=n*m;
11 r=i/m;
12 F=P*(1+r/100)^N;
13 disp("Maturity value after 10 years is : "+string(F)
    +" Rupees.");

```

Chapter 4

Present Worth Method of Comparison

Scilab code Exa 4.1 Suggest Best Technology

```
1 //Exa 4.1
2 clc;
3 clear;
4 close;
5 //Technology 1 :
6 disp("Technology 1 : ");
7 P=1200000; //in Rs
8 A=400000; //in Rs
9 i=20; //in % per annum
10 n=10; //in years
11 //Formula :  $(P/A, i, n) = ((1+i/100)^n - 1) / ((i/100) * (1 + i/100)^n)$ 
12 PW=-P+A*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n); //in
    RS
13 disp(PW, "The present worth for this technology in RS
    . : ");
14
15 //Technology 2 :
16 disp("Technology 2 : ");
```



```

17 P=2000000; //in Rs
18 A=600000; //in Rs
19 i=20; //in % per annum
20 n=10; //in years
21 //Formula :  $(P/A, i, n) = ((1+i/100)^n - 1) / ((i/100) * (1+i/100)^n)$ 
22 PW=-P+A*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n); //in
    RS
23 disp(PW,"The present worth for this technology in RS
    . : ");
24
25 //Technology 3 :
26 disp("Technology 3 : ");
27 P=1800000; //in Rs
28 A=500000; //in Rs
29 i=20; //in % per annum
30 n=10; //in years
31 //Formula :  $(P/A, i, n) = ((1+i/100)^n - 1) / ((i/100) * (1+i/100)^n)$ 
32 PW=-P+A*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n); //in
    RS
33 disp(PW,"The present worth for this technology in RS
    . : ");
34 disp("It is clear from the calculations that the
    present worth of technology 2 is the highest
    among all technologies. Therefore technology 2 is
    suggested for implementation to expand the
    production.");

```

Scilab code Exa 4.2 Determine which bid should be accepted

```

1 //Exa 4.2
2 clc;
3 clear;
4 close;

```

```

5 //Bid 1: Alpha Elevator Inc.
6 disp("Bid 1: Alpha Elevator Inc. ");
7 P=450000;//in Rs
8 A=27000;//in Rs
9 i=15;//in % per annum
10 n=15;//in years
11 //Formula :  $(P/A, i, n) = (((1+i/100)^n) - 1) / ((i/100) * (1+i/100)^n)$ 
12 PW=P+A*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n);//in
    RS
13 disp(PW,"The present worth for this bid in RS. : ");
14
15 //Bid 2: Beta Elevator Inc.
16 disp("Bid 2: Beta Elevator Inc. ");
17 P=540000;//in Rs
18 A=28500;//in Rs
19 i=15;//in % per annum
20 n=15;//in years
21 //Formula :  $(P/A, i, n) = (((1+i/100)^n) - 1) / ((i/100) * (1+i/100)^n)$ 
22 PW=P+A*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n);//in
    RS
23 disp(PW,"The present worth for this bid in RS. : ");
24 disp("The total present worth cost of bid 1 is less
    than that of bid 2. Hence bid 1 is to be selected
    for implementation. That is, the Elevator from
    Alpha Elevator Inc. is to be purchased and
    installed in the new building.");

```

Scilab code Exa 4.3 Which proposal should be selected

```

1 //Exa 4.3
2 clc;
3 clear;
4 close;

```

```

5 //Investment proposal A :
6 P1=-10000;//in Rs
7 P2=3000;//in Rs
8 P3=3000;//in Rs
9 P4=7000;//in Rs
10 P5=6000;//in Rs
11 i=18;//in % per annum
12 //Formula : (P/F,i,n) : 1/((1+i/100)^n)
13 PW_A=P1+P2*1/((1+i/100)^1)+P3*1/((1+i/100)^2)+P4
    *1/((1+i/100)^3)+P5*1/((1+i/100)^4);//in RS
14 disp(PW_A,"The present worth of A in RS. : ");
15
16 //Investment proposal B :
17 P1=-10000;//in Rs
18 P2=6000;//in Rs
19 P3=6000;//in Rs
20 P4=3000;//in Rs
21 P5=3000;//in Rs
22 i=18;//in % per annum
23 //Formula : (P/F,i,n) : 1/((1+i/100)^n)
24 PW_B=P1+P2*1/((1+i/100)^1)+P3*1/((1+i/100)^2)+P4
    *1/((1+i/100)^3)+P5*1/((1+i/100)^4);//in RS
25 disp(PW_B,"The present worth of B in RS. : ");
26 disp("At i=18%, the present worth of proposal B is
    higher than that of proposal A. Therefore , select
    proposal B.")

```

Scilab code Exa 4.4 Suggest Best Alternative

```

1 //Exa 4.4
2 clc;
3 clear;
4 close;
5 //Alternative 1 :
6 disp("In 1st alternative down payment : Rs.

```

```

        16,00,000");
7 //Alternative 2 :
8 P0=400000;//in Rs
9 P=200000;//in Rs
10 i=18;//in % per annum
11 n=10;//in years
12 //Formula : (P/A,i,n) : (((1+i/100)^n)-1)/((i/100)
        *(1+i/100)^n)
13 PW=P0+P*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n);//in
        RS
14 disp(PW,"The present worth of alternative 2 in RS. :
        ");
15 disp("The present worth of 2nd alternative is less
        than that of first one i.e., complete downpayment
        of Rs. 1600000. Hence, select 2nd alternative.")
        ;

```

Scilab code Exa 4.5 Select best Investment Plan

```

1 //Exa 4.5
2 clc;
3 clear;
4 close;
5 //Plan 1 :
6 P0=-1000;//in Rs
7 P=12000;//in Rs
8 i=12;//in % per annum
9 n=15;//in years
10 //Formula : (P/F,i,n) : 1/((1+i/100)^n)
11 PW1=P0+P*1/((1+i/100)^n);//in RS
12 disp(PW1,"The present worth of Plan-1 in RS. : ");
13
14 //Plan 2 :
15 P0=-1000;//in Rs
16 P=4000;//in Rs

```

```

17 i=12; //in % per annum
18 n1=10; //in years
19 n2=15; //in years
20 //Formula : (P/F,i,n) : 1/((1+i/100)^n)
21 PW2=P0+P*1/((1+i/100)^n1)+P*1/((1+i/100)^n2); //in
    RS
22 disp(PW2,"The present worth of Plan-2 in RS. : ");
23 disp("The present worth of Plan-1 is more than that
    of Plan-1. Therefore plan 1 is the best plan from
    the investors point of view.");

```

Scilab code Exa 4.6 Find Best Investment Alternative

```

1 //Exa 4.6
2 clc;
3 clear;
4 close;
5 //Novel Investment Ltd. Plan :
6 P0=-10000; //in Rs
7 P=800000; //in Rs
8 i=12; //in % per annum
9 n=20; //in years
10 //Formula : (P/F,i,n) : 1/((1+i/100)^n)
11 //Formula : (P/A,i,n) : (((1+i/100)^n)-1)/((i/100)
    *(1+i/100)^n)
12 PW1=P0*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n)+P
    *1/((1+i/100)^n); //in RS
13 disp(PW1,"The present worth of Plan-1 in RS. : ");
14
15 //Innovative Investment Ltd. Plan :
16 P0=-10000; //in Rs
17 P=1500000; //in Rs
18 i=12; //in % per annum
19 n1=20; //in years
20 n2=25; //in years

```

```

21 //Formula : (P/F,i,n) : 1/((1+i/100)^n)
22 PW2=P0*(((1+i/100)^n1)-1)/((i/100)*(1+i/100)^n1)+P
    *1/((1+i/100)^n2);//in RS
23 disp(PW2,"The present worth of Plan-1 in RS. : ");
24 disp("The present worth of Innovative Investment Ltd
    . Plan is more than that of Novel Investment Ltd.
    Plan. Therefore Innovative Investment Ltd. Plan
    is the best plan from the investors point of view
    .");

```

Scilab code Exa 4.7 Find Present Worth of Business

```

1 //Exa 4.7
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=12000;//in Rs
7 A1=10000;//in Rs
8 G=1000;//in Rs
9 i=18;//in % per annum
10 n=10;//in years
11 //Formula : (P/A,i,n)=(((1+i/100)^n)-1)/((i/100)*(1+
    i/100)^n)
12 //Formula : (A/G,i,n) :(((1+i/100)^n)-i*n/100-1)/(((
    i/100)*(1+i/100)^n)-i/100)
13 PW=-P+(A1+G*(((1+i/100)^n)-i*n/100-1)/(((i/100)*(1+i
    /100)^n)-i/100))*(((1+i/100)^n)-1)/((i/100)*(1+i
    /100)^n);//in RS
14 disp(PW,"The present worth of the small business in
    RS. : ");

```

Chapter 5

Future Worth Method

Scilab code Exa 5.1 Select best alternative

```
1 //Exa 5.1
2 clc;
3 clear;
4 close;
5 //Alternative A :
6 disp(" Alternative A : ");
7 P=5000000;//in Rs
8 A=2000000;//in Rs
9 i=18;//in % per annum
10 n=4;//in years
11 //Formula : (F/P,i,n) : (1+i/100)^n
12 //Formula : (F/A,i,n) : (((1+i/100)^n)-1)/(i/100)
13 FW_A=(-P*(1+i/100)^n)+(A*(((1+i/100)^n)-1)/(i/100));
    //in RS
14 disp(FW_A,"The future worth amount of alternative A
    in RS. : ");
15
16 //Alternative B :
17 disp(" Alternative B : ");
18 P=4500000;//in Rs
19 A=1800000;//in Rs
```

```

20 i=18; //in % per annum
21 n=4; //in years
22 //Formula : (F/P,i,n) : (1+i/100)^n
23 //Formula : (F/A,i,n) : (((1+i/100)^n)-1)/(i/100)
24 FW_B=(-P*(1+i/100)^n)+(A*(((1+i/100)^n)-1)/(i/100));
    //in RS
25 disp(FW_B,"The future worth amount of alternative B
    in RS. : ");
26 disp("The future worth of alternative A is greater
    than that of alternative B. Thus, alternative A
    should be selected.");
27 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 5.2 Evaluate the alternatives based on future worth method

```

1 //Exa 5.2
2 clc;
3 clear;
4 close;
5 //Alternative 1 :
6 disp("Alternative 1: ");
7 FC=2000000; //in Rs
8 AI=800000; //in Rs
9 ATax=80000; //in Rs
10 NetAI=AI-ATax; //in Rs
11
12 i=12; //in % per annum
13 n=20; //in years
14 //Formula : (F/P,i,n) : (1+i/100)^n
15 //Formula : (F/A,i,n) : (((1+i/100)^n)-1)/(i/100)
16 FW_1=(-FC*(1+i/100)^n)+(NetAI*(((1+i/100)^n)-1)/(i
    /100)); //in RS
17 disp(FW_1,"The future worth amount of alternative 1
    in RS. : ");
18

```



```

19 //Alternative 2 :
20 disp(" Alternative 2: ");
21 FC=3600000;//in Rs
22 AI=980000;//in Rs
23 ATax=150000;//in Rs
24 NetAI=AI-ATax;//in Rs
25
26 i=12;//in % per annum
27 n=20;//in years
28 //Formula : (F/P,i,n) : (1+i/100)^n
29 //Formula : (F/A,i,n) : (((1+i/100)^n)-1)/(i/100)
30 FW_2=(-FC*(1+i/100)^n)+(NetAI*(((1+i/100)^n)-1)/(i
    /100));//in RS
31 disp(FW_2,"The future worth amount of alternative 2
    in RS. : ");
32 disp("The future worth of alternative 1 is greater
    than that of alternative 2. Thus, building the
    gas station is the best alternative.");
33 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 5.3 Select best alternative

```

1 //Exa 5.3
2 clc;
3 clear;
4 close;
5 //Evaluation at i=8%
6 disp(" Evaluation at i=8%");
7 //Alternative 1 :
8 disp(" Alternative 1 : ");
9 P=500000;//in Rs
10 A1=50000;//in Rs
11 G=50000;//in Rs
12 i=8;//in % per annum
13 n=6;//in years

```

```

14 //Formula : (F/P,i,n) :  $(1+i/100)^n$ 
15 //Formula : (F/A,i,n) :  $\frac{((1+i/100)^n-1)}{(i/100)}$ 
16 //Formula : (A/G,i,n) :  $\frac{((1+i/100)^n-i*n/100-1)}{((i/100)*(1+i/100)^n-i/100)}$ 
17 FW_1=(-P*(1+i/100)^n)+(A1+G*((1+i/100)^n-i*n
      /100-1)/(((i/100)*(1+i/100)^n-i/100))*(((1+i
      /100)^n-1)/(i/100)); //in RS
18 disp(FW_1,"The future worth amount of alternative 1
      in RS. : ");
19
20 //Alternative 2 :
21 disp("Alternative 2 : ");
22 P=700000; //in Rs
23 A1=70000; //in Rs
24 G=70000; //in Rs
25 i=8; //in % per annum
26 n=6; //in years
27 //Formula : (F/P,i,n) :  $(1+i/100)^n$ 
28 //Formula : (F/A,i,n) :  $\frac{((1+i/100)^n-1)}{(i/100)}$ 
29 //Formula : (A/G,i,n) :  $\frac{((1+i/100)^n-i*n/100-1)}{((i/100)*(1+i/100)^n-i/100)}$ 
30 FW_2=(-P*(1+i/100)^n)+(A1+G*((1+i/100)^n-i*n
      /100-1)/(((i/100)*(1+i/100)^n-i/100))*(((1+i
      /100)^n-1)/(i/100)); //in RS
31 disp(FW_2,"The future worth amount of alternative 2
      in RS. : ");
32 disp("The future worth of alternative 2 is greater
      than that of alternative 1. Thus, alternative 2
      must be selected.");
33
34 //Evaluation at i=9%
35 disp("Evaluation at i=9%");
36 //Alternative 1 :
37 disp("Alternative 1 : ");
38 P=500000; //in Rs
39 A1=50000; //in Rs
40 G=50000; //in Rs
41 i=9; //in % per annum

```

```

42 n=6; //in years
43 //Formula : (F/P,i,n) :  $(1+i/100)^n$ 
44 //Formula : (F/A,i,n) :  $\frac{((1+i/100)^n - 1)}{(i/100)}$ 
45 //Formula : (A/G,i,n) :  $\frac{(((1+i/100)^n - i*n/100 - 1))}{((i/100)*(1+i/100)^n - i/100)}$ 
46 FW_1=(-P*(1+i/100)^n)+(A1+G*(((1+i/100)^n - i*n
      /100 - 1)/(((i/100)*(1+i/100)^n - i/100)))*(((1+i
      /100)^n - 1)/(i/100); //in RS
47 disp(FW_1,"The future worth amount of alternative 1
      in RS. : ");
48
49 //Alternative 2 :
50 disp("Alternative 2 : ");
51 P=700000; //in Rs
52 A1=70000; //in Rs
53 G=70000; //in Rs
54 i=9; //in % per annum
55 n=6; //in years
56 //Formula : (F/P,i,n) :  $(1+i/100)^n$ 
57 //Formula : (F/A,i,n) :  $\frac{((1+i/100)^n - 1)}{(i/100)}$ 
58 //Formula : (A/G,i,n) :  $\frac{(((1+i/100)^n - i*n/100 - 1))}{((i/100)*(1+i/100)^n - i/100)}$ 
59 FW_2=(-P*(1+i/100)^n)+(A1+G*(((1+i/100)^n - i*n
      /100 - 1)/(((i/100)*(1+i/100)^n - i/100)))*(((1+i
      /100)^n - 1)/(i/100); //in RS
60 disp(FW_2,"The future worth amount of alternative 2
      in RS. : ");
61 disp("The future worth of alternative 2 is greater
      than that of alternative 1. Thus, alternative 2
      must be selected.");
62
63 //Evaluation at i=20%
64 disp("Evaluation at i=20%");
65 //Alternative 1 :
66 disp("Alternative 1 : ");
67 P=500000; //in Rs
68 A1=50000; //in Rs
69 G=50000; //in Rs

```

```

70 i=20; //in % per annum
71 n=6; //in years
72 //Formula : (F/P,i,n) : (1+i/100)^n
73 //Formula : (F/A,i,n) : (((1+i/100)^n)-1)/(i/100)
74 //Formula : (A/G,i,n) : (((1+i/100)^n)-i*n/100-1)/(((
    i/100)*(1+i/100)^n)-i/100)
75 FW_1=(-P*(1+i/100)^n)+(A1+G*(((1+i/100)^n)-i*n
    /100-1)/(((i/100)*(1+i/100)^n)-i/100))*(((1+i
    /100)^n)-1)/(i/100); //in RS
76 disp(FW_1,"The future worth amount of alternative 1
    in RS. : ");
77
78 //Alternative 2 :
79 disp(" Alternative 2 : ");
80 P=700000; //in Rs
81 A1=70000; //in Rs
82 G=70000; //in Rs
83 i=20; //in % per annum
84 n=6; //in years
85 //Formula : (F/P,i,n) : (1+i/100)^n
86 //Formula : (F/A,i,n) : (((1+i/100)^n)-1)/(i/100)
87 //Formula : (A/G,i,n) : (((1+i/100)^n)-i*n/100-1)/(((
    i/100)*(1+i/100)^n)-i/100)
88 FW_2=(-P*(1+i/100)^n)+(A1+G*(((1+i/100)^n)-i*n
    /100-1)/(((i/100)*(1+i/100)^n)-i/100))*(((1+i
    /100)^n)-1)/(i/100); //in RS
89 disp(FW_2,"The future worth amount of alternative 2
    in RS. : ");
90 disp("The negative sign of alternatives future worth
    indicates that alternative 2 incurs loss. Thus,
    none of the two alternatives should be selected.
    ");
91 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 5.4 Find Best Alternative

```

1 //Exa 5.4
2 clc;
3 clear;
4 close;
5 //Alternative 1 :
6 disp(" Alternative 1 :");
7 P=8000000;//in Rs
8 A=800000;//in Rs
9 i=20;//in % per annum
10 n=12;//in years
11 Salvage=500000;//in Rs
12 //Formula :  $(1+i/100)^n$ 
13 //Formula :  $(F/A, i, n) : (((1+i/100)^n)-1)/(i/100)$ 
14 FW1=P*(1+i/100)^n+A*(((1+i/100)^n)-1)/(i/100)-
    Salvage;//in RS
15 disp(FW1,"The future worth for this alternative in
    RS. : ");
16
17 //Alternative 2 :
18 disp(" Alternative 2 :");
19 P=7000000;//in Rs
20 A=900000;//in Rs
21 i=20;//in % per annum
22 n=12;//in years
23 Salvage=400000;//in Rs
24 //Formula :  $(1+i/100)^n$ 
25 //Formula :  $(F/A, i, n) : (((1+i/100)^n)-1)/(i/100)$ 
26 FW2=P*(1+i/100)^n+A*(((1+i/100)^n)-1)/(i/100)-
    Salvage;//in RS
27 disp(FW2,"The future worth for this alternative in
    RS. : ");
28
29 //Alternative 3 :
30 disp(" Alternative 3 :");
31 P=9000000;//in Rs
32 A=850000;//in Rs
33 i=20;//in % per annum
34 n=12;//in years

```

```

35 Salvage=700000; //in Rs
36 //Formula :  $(1+i/100)^n$ 
37 //Formula :  $(F/A, i, n) : (((1+i/100)^n)-1)/(i/100)$ 
38 FW3=P*(1+i/100)^n+A*(((1+i/100)^n)-1)/(i/100)-
    Salvage; //in RS
39 disp(FW3, "The future worth for this alternative in
    RS. : ");
40 disp("The future worth of alternative 2 is less than
    that of other two alternatives. Thus, Ms.
    Krishna castings should buy the annealing furnace
    from manufacturer 2.");
41 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 5.5 Which Machine should be selected

```

1 //Exa 5.5
2 clc;
3 clear;
4 close;
5 //Machine A :
6 disp("Machine A: ");
7 P=400000; //in Rs
8 A=40000; //in Rs
9 S=200000; //in Rs
10 i=12; //in % per annum
11 n=4; //in years
12 //Formula :  $(F/P, i, n) : (1+i/100)^n$ 
13 //Formula :  $(F/A, i, n) : (((1+i/100)^n)-1)/(i/100)$ 
14 FW_A=(P*(1+i/100)^n)+(A*(((1+i/100)^n)-1)/(i/100))-S
    ; //in RS
15 disp(FW_A, "The future worth amount of Machine A in
    RS. : ");
16
17 //Machine B :
18 disp("Machine AB: ");

```

```

19 P=800000; //in Rs
20 A=0; //in Rs
21 S=550000; //in Rs
22 i=12; //in % per annum
23 n=4; //in years
24 //Formula : (F/P,i,n) : (1+i/100)^n
25 //Formula : (F/A,i,n) : (((1+i/100)^n)-1)/(i/100)
26 FW_B=(P*(1+i/100)^n)+(A*(((1+i/100)^n)-1)/(i/100))-S
    ; //in RS
27 disp(FW_B,"The future worth amount of Machine B in
    RS. : ");
28 disp("The future worth of Machine A is less than
    that of Machine B. Thus, Machine A should be
    selected.");
29 //Note : Calculation in the book is not accurate.

```

Chapter 6

Annual Equivalent Method

Scilab code Exa 6.1 Decision to provide rental car to Executive

```
1 //Exa 6.1
2 clc;
3 clear;
4 close;
5 //GIVEN DATA :
6 disp("Average No. of Km run/year = 20000 Km");
7 disp("No. of Km/litre of petrol = 9 Km");
8 disp("Therefore ,");
9 disp("Petrol consumption/year = 20000/9 = 2222.2
    litre");
10 disp("Cost/litre of petrol for the 1st year = Rs. 21
    ");
11 disp("Cost/litre of petrol for the 2nd year = Rs. 21
    + Re. 1 = Rs. 22 ");
12 disp("Cost/litre of petrol for the 3rd year = Rs. 22
    + Re. 1 = Rs. 23 ");
13 disp("Cost/litre of petrol for the 4th year = Rs. 23
    + Re. 1 = Rs. 24 ");
14
15 disp("Fuel expenditure for 1st year = 2222.2 * 21 =
    Rs. 46666.20");
```



```

16 disp("Fuel expenditure for 2nd year = 2222.2 * 22 =
    Rs. 48888.40");
17 disp("Fuel expenditure for 3rd year = 2222.2 * 23 =
    Rs. 51110.60");
18 disp("Fuel expenditure for 4th year = 2222.2 * 24 =
    Rs. 53332.80");
19 disp("The annual equal increment of the above
    expendiyure is Rs. 2222.20(G)");
20
21 A1=46666.20; //in Rs.
22 G=2222.20; //in Rs.
23 i=18; //in % per annum
24 n=4; //in years
25 A=A1+G*(((1+i/100)^n)-i*n/100-1)/(((i/100)*(1+i/100)
    ^n)-i/100) ;
26 disp(A,"Annual equal amount spending for petrol in
    Rs. : ");
27 disp("This amoount is less than the annual rental
    value of Rs. 60000. Therefore, the company should
    continue to provide its own car to its executive
    . ");

```

Scilab code Exa 6.2 Determine Best Alternative

```

1 //Exa 6.2
2 clc;
3 clear;
4 close;
5 //Alternative 1 :
6 disp("Alternative 1: ");
7 P=500000; //in Rs
8 A=200000; //in Rs
9 i=20; //in % per annum
10 n=15; //in years
11 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i

```

```

    /100)^n)-1)
12 AE_1=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+A; //
    in RS
13 disp(AE_1,"The Annual equivalent cost of alternative
    1 in RS. : ");
14
15 //Alternative 2 :
16 disp("Alternative 2: ");
17 P=400000; //in Rs
18 A=300000; //in Rs
19 i=20; //in % per annum
20 n=15; //in years
21 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
22 AE_2=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+A; //
    in RS
23 disp(AE_2,"The Annual equivalent cost of alternative
    1 in RS. : ");
24
25 //Alternative 3 :
26 disp("Alternative 3: ");
27 P=600000; //in Rs
28 A=150000; //in Rs
29 i=20; //in % per annum
30 n=15; //in years
31 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
32 AE_3=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+A; //
    in RS
33 disp(AE_3,"The Annual equivalent cost of alternative
    1 in RS. : ");
34 disp("The annual equivalent cost of manufacturer 3
    is less than that of other two. Therefore ,
    company should buy advanced machine centre from
    manufacturer 3. ");
35 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 6.3 Determine Best Alternative

```
1 //Exa 6.3
2 clc;
3 clear;
4 close;
5 //Alternative A :
6 disp(" Alternative A: ");
7 P=150000; //in Rs
8 A=60000; //in Rs
9 S=15000; //in Rs
10 i=25; //in % per annum
11 n=5; //in years
12 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
13 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
14 AE_A=-P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+A+S
    *(i/100)/(((1+i/100)^n)-1); //in RS
15 disp(AE_A,"The Annual equivalent revenue of
    alternative A in RS. : ");
16 //Alternative B :
17 disp(" Alternative B: ");
18 P=175000; //in Rs
19 A=70000; //in Rs
20 S=35000; //in Rs
21 i=25; //in % per annum
22 n=5; //in years
23 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
24 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
25 AE_B=-P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+A+S
    *(i/100)/(((1+i/100)^n)-1); //in RS
26 disp(AE_B,"The Annual equivalent revenue of
    alternative A in RS. : ");
```

```

27 disp("The annual equivalent net return of
    alternative B is more than that of alternative A.
    Thus the company should select alternative A");
28 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 6.4 Which Machine would you choose

```

1 //Exa 6.4
2 clc;
3 clear;
4 close;
5 //Machine X :
6 disp("Machine X : ");
7 P=150000; //in Rs
8 A=0; //in Rs
9 S=0; //in Rs
10 i=15; //in % per annum
11 n=12; //in years
12 //Formula : (A/P, i, n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
13 AE_X=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1); //in
    RS
14 disp(AE_X, "The Annual equivalent cost of machine X
    in RS. : ");
15
16 //Machine Y :
17 disp("Machine Y : ");
18 P=240000; //in Rs
19 A=4500; //in Rs
20 S=60000; //in Rs
21 i=15; //in % per annum
22 n=12; //in years
23 //Formula : (A/P, i, n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
24 //Formula : (A/F, i, n) : (i/100)/(((1+i/100)^n)-1)

```

```

25 AE_Y=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+A-S*(
    i/100)/(((1+i/100)^n)-1); //in RS
26 disp(AE_Y,"The Annual equivalent cost of machine X
    in RS. : ");
27 disp("The annual equivalent cost of machine X is
    less than that of machine Y. So machine X is more
    cost effective machine. ");
28 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 6.5 Should Power Line routed around or over the lake

```

1 //Exa 6.5
2 clc;
3 clear;
4 close;
5 //Alternative 1 : Around the lake
6 disp("Alternative 1 : Around the lake");
7 FC=15*150000; //in Rs
8 MC=15*6000; //in Rs
9 PL=15*15000; //in Rs
10 MCPL=MC+PL; //in Rs
11 S=15*90000; //in Rs
12 i=15; //in % per annum
13 n=15; //in years
14 //Formula : (A/F, i, n) : (i/100)/(((1+i/100)^n)-1)
15 //Formula : (A/P, i, n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
16 AE1=FC*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+MCPL-
    S*(i/100)/(((1+i/100)^n)-1); //in RS
17 disp(AE1,"The Annual equivalent cost for this
    alternative in RS. : ");
18
19 //Alternative 1 : Under the lake
20 FC=5*750000; //in Rs
21 MC=5*12000; //in Rs

```

```

22 PL=5*15000; //in Rs
23 MCPL=MC+PL; //in Rs
24 S=5*150000; //in Rs
25 i=15; //in % per annum
26 n=15; //in years
27 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
28 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
29 AE2=FC*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+MCPL-
    S*(i/100)/(((1+i/100)^n)-1); //in RS
30 disp(AE2,"The Annual equivalent cost for this
    alternative in RS. : ");
31 disp("The annual equivalent cost of alternative 1 is
    less than that of alternative 2. Therefore,
    select the route around the lake for laying the
    power line.");
32 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 6.6 Determine the more economical choice

```

1 //Exa 6.6
2 clc;
3 clear;
4 close;
5 //Alternative 1 : Purchase of diesel Taxi
6 disp("Alternative 1 : Purchase of diesel Taxi");
7 VC=390000; //in Rs
8 LpY=60000/30; //in litres
9 FcY=2000*8; //in Rs
10 AllExp=FcY+9000+15000; //in Rs
11 S=60000; //in Rs
12 i=20; //in % per annum
13 n=4; //in years
14 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
15 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i

```

```

    /100)^n)-1)
16 AE1=VC*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+
    AllExp-S*(i/100)/(((1+i/100)^n)-1); //in RS
17 disp(AE1,"The Annual equivalent cost for this
    alternative in RS. : ");
18
19 //Alternative 2 : Purchase of petrol Taxi
20 disp("Alternative 2 : Purchase of petrol Taxi");
21 VC=360000; //in Rs
22 LpY=60000/20; //in litres
23 FcY=3000*20; //in Rs
24 AllExp=FcY+6000+15000; //in Rs
25 S=90000; //in Rs
26 i=20; //in % per annum
27 n=3; //in years
28 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
29 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
30 AE2=VC*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+
    AllExp-S*(i/100)/(((1+i/100)^n)-1); //in RS
31 disp(AE2,"The Annual equivalent cost for this
    alternative in RS. : ");
32 disp("The annual equivalent cost of purchase and
    operation of cars with diesel engine is less than
    that of cars with petrol engine. Therefore, the
    taxy company should buy cars with diesel engine."
    );
33 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 6.7 Determine Which Alternative to Select

```

1 //Exa 6.7
2 clc;
3 clear;
4 close;

```

```

5 //Alternative 1 : Purchase car for cash
6 disp(" Alternative 1 : Purchase car for cash");
7 Pprice=390000;//in Rs
8 n=3;//in years
9 n=n*12;//in months
10 S=120000;//in Rs
11 i=12;//in % nominal rate(Compounded anually)
12 i=i/12;//in % compounded monthly
13 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
14 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
15 ME1=Pprice*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)-S
    *(i/100)/(((1+i/100)^n)-1);//in RS
16 disp(ME1,"The Monthly equivalent cost for this
    alternative in RS. : ");
17
18 //Alternative 2 : Use of car under lease
19 disp(" Alternative 2 : Use of car under lease");
20 LeaseAmount=10500;//in Rs
21 MonthlyEquiCost=LeaseAmount;//in Rs.
22 disp(MonthlyEquiCost,"The Monthly equivalent cost
    for this alternative in RS. : ");
23 disp("The monthly equivalent cost of alternative 1
    is less than that of alternative 2. hence the
    salesman should purchase the car for cash.")

```

Scilab code Exa 6.8 Which Machine should be purchased

```

1 //Exa 6.8
2 clc;
3 clear;
4 close;
5 //Machine A :
6 disp(" Machine A : ");
7 IC=300000;//in Rs

```



```

8 n=4; //in years
9 S=200000; //in Rs
10 AM=30000; //in Rs
11 i=15; //in % per annum
12 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
13 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
14 AE_A=IC*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+AM-S
    *(i/100)/(((1+i/100)^n)-1); //in RS
15 disp(AE_A,"The Annual equivalent cost of machine X
    in RS. : ");
16
17 //Machine B :
18 disp("Machine B : ");
19 IC=600000; //in Rs
20 n=4; //in years
21 S=300000; //in Rs
22 AM=0; //in Rs
23 i=15; //in % per annum
24 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
25 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
26 AE_B=IC*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+AM-S
    *(i/100)/(((1+i/100)^n)-1); //in RS
27 disp(AE_B,"The Annual equivalent cost of machine X
    in RS. : ");
28 disp("The annual equivalent cost of machine A is
    less than that of machine B. So machine A is more
    cost effective machine. It is advised to buy
    machine A ");
29 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 6.9 Determine Best Alternative for Lakshimi

```
1 //Exa 6.9
```

```

2  clc;
3  clear;
4  close;
5  //Alternative 1 :
6  disp(" Alternative 1 : ");
7  DP=60000; //in Rs
8  P1=15000; //in Rs
9  n=1; //in years
10 i=12; //in % Compounded anually
11 //Formula : (P/F,i,n) : 1/((1+i/100)^n)
12 PW1=DP+P1*1/((1+i/100)^n); //in RS
13 disp(PW1,"The annual equivalent for this alternative
        in RS. : ");
14 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
        /100)^n)-1)
15 n=4; //in years
16 AE1=PW1*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)
17 disp(AE1,"The annual equivalent for this alternative
        in RS. : ");
18
19 //Alternative 2 :
20 disp(" Alternative 2 : ");
21 P4y=90000; //in Rs
22 AE2=P4y*(i/100)/(((1+i/100)^n)-1); //in Rs.
23 disp(AE2,"The annual equivalent for this alternative
        in RS. : ");
24 disp("The annual equivalent cost of alternative 2 is
        less than that of alternative 1. Hence, Joshi
        Lakshimi should select alternative 2 for
        purchasing the home equipment.");
25 //Note : Calculation in the book is not accurate.

```

Scilab code Exa 6.10 Which tyre should be buy

```
1 //Exa 6.10
```

```

2  clc;
3  clear;
4  close;
5  //Brand A :
6  disp("Brand A : ");
7  w=12; //in months
8  P=1200; //in Rs/tyre
9  i=12; //in % nominal rate(Compounded anually)
10 i=i/12; //in % compounded monthly
11 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
12 AE_A=P*((i/100)*(1+i/100)^w)/(((1+i/100)^w)-1); //in
    RS
13 disp(AE_A,"The annual equivalent for this brand in
    RS. : ");
14
15 //Brand B :
16 disp("Brand B : ");
17 w=24; //in months
18 P=1800; //in Rs/tyre
19 i=12; //in % nominal rate(Compounded anually)
20 i=i/12; //in % compounded monthly
21 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
22 AE_B=P*((i/100)*(1+i/100)^w)/(((1+i/100)^w)-1); //in
    RS
23 disp(AE_B,"The annual equivalent for this brand in
    RS. : ");
24
25 //Brand C :
26 disp("Brand C : ");
27 w=36; //in months
28 P=2100; //in Rs/tyre
29 i=12; //in % nominal rate(Compounded anually)
30 i=i/12; //in % compounded monthly
31 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
32 AE_C=P*((i/100)*(1+i/100)^w)/(((1+i/100)^w)-1); //in

```

```

RS
33 disp(AE_C,"The annual equivalent for this brand in
    RS. : ");
34
35 //Brand D :
36 disp("Brand D : ");
37 w=48;//in months
38 P=2700;//in Rs/tyre
39 i=12;//in % nominal rate(Compounded anually)
40 i=i/12;//in % compounded monthly
41 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
42 AE_D=P*((i/100)*(1+i/100)^w)/(((1+i/100)^w)-1);//in
    RS
43 disp(AE_D,"The annual equivalent for this brand in
    RS. : ");
44
45 disp("Here common multiple lives of tyres is
    considered. This is 144 months. Therefore, the
    comparison is made on 144 months basis.");
46 disp("The annual equivalent cost of Brand C is less
    than that of other brands. hence, it should be
    used in the vehicles of the trucking company. It
    should be replaced for times during the 144
    months period.");

```

Chapter 7

Rate of Return Method

Scilab code Exa 7.1 Find the Rate of Return

```
1 //Exa 7.1
2 clc;
3 clear;
4 close;
5 //Given data :
6 Ii=100000;//in Rs
7 Ar=30000;//in Rs
8 n=5;//in years
9 //Formula :  $(P/A, i, n) = (((1+i/100)^n) - 1) / ((i/100) * (1 + i/100)^n)$ 
10 // when i=10 %
11 i1=10;//in % per annum
12 PW1=-Ii+Ar*(((1+i1/100)^n)-1)/((i1/100)*(1+i1/100)^n);
13 //in RS
13 disp(PW1,"The present worth for i=10% in RS. : ");
14 // when i=15 %
15 i2=15;//in % per annum
16 PW2=-Ii+Ar*(((1+i2/100)^n)-1)/((i2/100)*(1+i2/100)^n);
17 //in RS
17 disp(PW2,"The present worth for i=15% in RS. : ");
18 // when i=18 %
```

```

19 i3=18; //in % per annum
20 PW3=-Ii+Ar*(((1+i3/100)^n)-1)/((i3/100)*(1+i3/100)^n
    ); //in RS
21 disp(PW3,"The present worth for i=18% in RS. : ");
22 disp("Present worth for i=15% is suitable.");
23 i=15+(PW2-0)*(i3-i2)/(PW2-PW3); //in Rs.
24 disp(i,"Therefore, the rate of return for the new
    business in % per annum :");

```

Scilab code Exa 7.2 Find the Rate of Return

```

1 //Exa 7.2
2 clc;
3 clear;
4 close;
5 //Given data :
6 Io=2000000; //in Rs
7 ANP=350000; //in Rs
8 S=0; //in Rs
9 n=10; //in years
10 //Formula :  $(P/A, i, n) = (((1+i/100)^n) - 1) / ((i/100) * (1 + i/100)^n)$ 
11 // when i=10 %
12 i1=10; //in % per annum
13 PW1=-Io+ANP*(((1+i1/100)^n)-1)/((i1/100)*(1+i1/100)^
    n); //in RS
14 disp(PW1,"The present worth for i=10% in RS. : ");
15 // when i=12 %
16 i2=12; //in % per annum
17 PW2=-Io+ANP*(((1+i2/100)^n)-1)/((i2/100)*(1+i2/100)^
    n); //in RS
18 disp(PW2,"The present worth for i=15% in RS. : ");
19 disp("Present worth for i=10% is suitable.");
20 i=10+(PW1-0)*(i2-i1)/(PW1-PW2); //in Rs.
21 disp(i,"Therefore, the rate of return of the new

```

product line in % per annum :");

Scilab code Exa 7.3 Find Best Alternative based on Rat of Return method

```
1 //Exa 7.3
2 clc;
3 clear;
4 close;
5 //Alternative 1:
6 disp(" Alternative 1:");
7 Io=150000;//in Rs
8 Ap=45570;//in Rs
9 n=5;//in years
10 //Formula :  $(P/A, i, n) = (((1+i/100)^n) - 1) / ((i/100) * (1 + i/100)^n)$ 
11 // when i=10 %
12 i1=10;//in % per annum
13 PW1=-Io+Ap*(((1+i1/100)^n)-1)/((i1/100)*(1+i1/100)^n
);//in RS
14 disp(PW1,"The present worth for i=10% in RS. : ");
15 // when i=12 %
16 i2=12;//in % per annum
17 PW2=-Io+Ap*(((1+i2/100)^n)-1)/((i2/100)*(1+i2/100)^n
);//in RS
18 disp(PW2,"The present worth for i=10% in RS. : ");
19 // when i=15 %
20 i3=15;//in % per annum
21 PW3=-Io+Ap*(((1+i3/100)^n)-1)/((i3/100)*(1+i3/100)^n
);//in RS
22 disp(PW3,"The present worth for i=10% in RS. : ");
23 // when i=18 %
24 i4=18;//in % per annum
25 PW4=-Io+Ap*(((1+i4/100)^n)-1)/((i4/100)*(1+i4/100)^n
);//in RS
26 disp(PW4,"The present worth for i=10% in RS. : ");
```

```

27 disp("Present worth for i=15% is suitable.");
28 i=i3+(PW3-0)*(i4-i3)/(PW3-PW4); //in Rs.
29 disp(i,"Therefore, the rate of return of alternative
      in % per annum :");
30
31 //Alternative 2:
32 disp("Alternative 2:");
33 Io=210000; //in Rs
34 Ap=58260; //in Rs
35 n=5; //in years
36 //Formula : (P/A,i,n)=(((1+i/100)^n)-1)/((i/100)*(1+
      i/100)^n)
37 // when i=12 %
38 i1=12; //in % per annum
39 PW1=-Io+Ap*(((1+i1/100)^n)-1)/((i1/100)*(1+i1/100)^n
      ); //in RS
40 disp(PW1,"The present worth for i=12% in RS. : ");
41 // when i=13 %
42 i2=13; //in % per annum
43 PW2=-Io+Ap*(((1+i2/100)^n)-1)/((i2/100)*(1+i2/100)^n
      ); //in RS
44 disp(PW2,"The present worth for i=13% in RS. : ");
45 disp("Present worth for i=12% is suitable.");
46 i=i1+(PW1-0)*(i2-i1)/(PW1-PW2); //in Rs.
47 disp(i,"Therefore, the rate of return of alternative
      2 in % per annum :");
48
49 //Alternative 3:
50 disp("Alternative 3:");
51 Io=255000; //in Rs
52 Ap=69000; //in Rs
53 n=5; //in years
54 //Formula : (P/A,i,n)=(((1+i/100)^n)-1)/((i/100)*(1+
      i/100)^n)
55 // when i=11 %
56 i1=11; //in % per annum
57 PW1=-Io+Ap*(((1+i1/100)^n)-1)/((i1/100)*(1+i1/100)^n
      ); //in RS

```



```

58 disp(PW1,"The present worth for i=11% in RS. : ");
59 // when i=12 %
60 i2=12;//in % per annum
61 PW2=-Io+Ap*(((1+i2/100)^n)-1)/((i2/100)*(1+i2/100)^n
    );//in RS
62 disp(PW2,"The present worth for i=12% in RS. : ");
63 disp("Present worth for i=11% is suitable.");
64 i=i1+(PW1-0)*(i2-i1)/(PW1-PW2);//in Rs.
65 disp(i,"Therefore , the rate of return of the
    alternative 3 in % per annum :");
66 disp("");
67 disp("It is clear that rate of return for
    alternative 3v is less than the minimum
    attractive rate of return of 12 %. So it should
    not be considered for comparison. the remaining
    two alternatives are qualified for consideration.
    Among the alternatives 1 and 2, the rate of
    return of 1 is greater than that of 2. ence ,
    alternative 1 should be selected. ");

```

Scilab code Exa 7.4 Compute Rate of Return

```

1 //Exa 7.4
2 clc;
3 clear;
4 close;
5 //Given data
6 A0=-1275;//in Rs
7 A1=150;//in Rs
8 G=150;//in Rs
9 i=10;//in % per annum
10 n=5;//in years
11 //Formula : (A/G,i,n) :(((1+i/100)^n)-i*n/100-1)/(((
    i/100)*(1+i/100)^n)-i/100)
12 A=A1+G*(((1+i/100)^n)-i*n/100-1)/(((i/100)*(1+i/100)

```

```

    ^n)-i/100) ;//in RS
13 disp(A,"The annual equivalent of the positive cash
    flows in RS. : ");
14 //Formula : (P/A,i,n) : (((1+i/100)^n)-1)/((i/100)
    *(1+i/100)^n)
15 i1=10;//in % per annum
16 PW1=A0+(A1+G*(((1+i1/100)^n)-i1*n/100-1)/(((i1/100)
    *(1+i1/100)^n)-i1/100))*(((1+i1/100)^n)-1)/((i1
    /100)*(1+i1/100)^n);''//i1n Rs.
17 disp(PW1,"PW(10) :");
18 i2=12;//i2n % per annum
19 PW2=A0+(A1+G*(((1+i2/100)^n)-i2*n/100-1)/(((i2/100)
    *(1+i2/100)^n)-i2/100))*(((1+i2/100)^n)-1)/((i2
    /100)*(1+i2/100)^n);''//i2n Rs.
20 disp(PW2,"PW(12) :");
21 i3=15;//i3n % per annum
22 PW3=A0+(A1+G*(((1+i3/100)^n)-i3*n/100-1)/(((i3/100)
    *(1+i3/100)^n)-i3/100))*(((1+i3/100)^n)-1)/((i3
    /100)*(1+i3/100)^n);''//i3n Rs.
23 disp(PW3,"PW(15) :");
24 i4=18;//in % per annum
25 PW4=A0+(A1+G*(((1+i4/100)^n)-i4*n/100-1)/(((i4/100)
    *(1+i4/100)^n)-i4/100))*(((1+i4/100)^n)-1)/((i4
    /100)*(1+i4/100)^n);''//in Rs.
26 disp(PW4,"PW(18) :");
27
28 disp("Present worth for i=15% is suitable.");
29 i=i3+(PW3-0)*(i4-i3)/(PW3-PW4);//in Rs.
30 disp(i,"Therefore, the rate of return for the given
    cash flow in % per annum :");

```

Scilab code Exa 7.5 Suggest Best Alternative

```

1 //Exa 7.5
2 clc;

```

```

3 clear;
4 close;
5 // Alternative 1:
6 disp(" Alternative 1:");
7 Io=500000; //in Rs
8 Ar=170000; //in Rs
9 n=5; //in years
10 //Formula :  $(P/A, i, n) = ((1+i/100)^n - 1) / ((i/100) * (1 + i/100)^n)$ 
11 // when i=15 %
12 i1=15; //in % per annum
13 PW1=-Io+Ar*(((1+i1/100)^n)-1)/((i1/100)*(1+i1/100)^n
); //in RS
14 disp(PW1,"The present worth(PW(15%)) for i=10% in RS
. : ");
15 // when i=17 %
16 i2=17; //in % per annum
17 PW2=-Io+Ar*(((1+i2/100)^n)-1)/((i2/100)*(1+i2/100)^n
); //in RS
18 disp(PW2,"The present worth(PW17(%)) for i=10% in RS
. : ");
19 // when i=20 %
20 i3=20; //in % per annum
21 PW3=-Io+Ar*(((1+i3/100)^n)-1)/((i3/100)*(1+i3/100)^n
); //in RS
22 disp(PW3,"The present worth(PW(20%)) for i=10% in RS
. : ");
23 // when i=22 %
24 i4=22; //in % per annum
25 PW4=-Io+Ar*(((1+i4/100)^n)-1)/((i4/100)*(1+i4/100)^n
); //in RS
26 disp(PW4,"The present worth(PW(22%)) for i=10% in RS
. : ");
27 disp(" Present worth for i=15% is suitable.");
28 i=i3+(PW3-0)*(i4-i3)/(PW3-PW4); //in Rs.
29 disp(i,"Therefore, the rate of return of alternative
1 in % per annum :");
30

```

```

31 // Alternative 2:
32 disp(" Alternative 2:");
33 Io=800000; //in Rs
34 Ar=270000; //in Rs
35 n=5; //in years
36 //Formula :  $(P/A, i, n) = \frac{((1+i/100)^n - 1)}{(i/100) * (1 + i/100)^n}$ 
37 // when i=20 %
38 i3=20; //in % per annum
39 PW3=-Io+Ar*((1+i3/100)^n - 1)/((i3/100)*(1+i3/100)^n
); //in RS
40 disp(PW3, "The present worth(PW(20%)) for i=10% in RS
. : ");
41 // when i=22 %
42 i4=22; //in % per annum
43 PW4=-Io+Ar*((1+i4/100)^n - 1)/((i4/100)*(1+i4/100)^n
); //in RS
44 disp(PW4, "The present worth(PW(22%)) for i=10% in RS
. : ");
45 disp("Present worth for i=15% is suitable.");
46 i=i3+(PW3-0)*(i4-i3)/(PW3-PW4); //in Rs.
47 disp(i, "Therefore, the rate of return of alternative
2 in % per annum :");
48 disp("Since the rate of return of alternative 1 is
greater than that of the alternative 2, select
alternative 1. ");

```

Chapter 8

Replacement and Maintenance Analysis

Scilab code Exa 8.1 When should equipment be replaced

```
1 //Exa 8.1
2 clc;
3 clear;
4 close;
5 //given data :
6 //When i=0%
7 disp("When i = 0% :");
8 FC=4000;//in Rs.
9 i=0;//in % per annum
10 MC1=0;//in Rs.
11 disp("Tabulation to determine economic life : ");
12 disp("End of      Maintenance      Summation of
      Avg cost of      Avg FC if      Avg total");
13 disp(" year      cost at end      maintenance
      maintenance      replaced at      cost through");
14 disp("          of year      costs
      through year      year given      year given");
15 disp("  A          B(Rs.)      C(Rs.)
          D(Rs.)          E(Rs.)          F(Rs.)");
```

```

16 disp(" 1          0          0
          0          4000          4000");
17 disp(" 2          200          200
          100          2000          2100");
18 disp(" 3          400          600
          200          1333.33          1533.33");
19 disp(" 4          600          1200
          300          1000          1300");
20 disp(" 5          800          2000
          400          800          1200");
21 disp(" 6          1000          3000
          500          666.67          1166.67");
22 disp(" 7          1200          4200
          600          571.43          1171.43");
23 disp("Economic life of the machine : 6 years");
24 disp("Column C summarizes the summation of
      maintenance costs for each replacement period.
      The value corresponding to any end of year in
      this column represents the total maintenance
      costs of using the equipment till the end of that
      year. It gives the Economic life of the machine
      : 6 years");
25
26 //When i=12%
27 disp("When i = 12% :");
28 i=12; //in % per annum
29 FC=4000; //in Rs.
30 disp("Tabulation to determine economic life : ");
31 disp("End of      Maintenance      P/F      PW as
      of begin      Summation of      PW of      A/P
      Annual equi");
32 disp(" year      cost at end      12%      of
      year of      PW of      cumulative      12%
      total cost");
33 disp("      of year      n
      maintenance      maintenance      maintenance      n
      of year");
34 disp(" A          B(Rs.)          C(Rs.)

```

	G(rs.)	D(Rs.) H(rs.)");	E(Rs.)	F(Rs.)
35	disp(" 1 0 0.00 1.1200 4480.00");	0	0.8929 0.00	4000.00
36	disp(" 2 159.44 2461.14");	200 159.44	0.7972 4159.44	0.5917
37	disp(" 3 284.72 1850.10");	400 444.16	0.7118 4444.16	0.4163
38	disp(" 4 381.30 1588.54");	600 825.46	0.6355 4825.46	0.3292
39	disp(" 5 453.92 1464.50");	800 1279.38	0.5674 5279.38	0.2774
40	disp(" 6 506.60 1407.15");	1000 1785.98	0.5066 5785.98	0.2432
41	disp(" 7 542.88 1386.65");	1200 2328.86	0.4524 6328.86	0.2191
42	disp(" 8 565.46 1387.83");	1400 2894.32	0.4039 6894.32	0.2013
43	disp(" 9 576.96 1402.36");	1600 3471.28	0.3606 7471.28	0.1877
44	disp(" 10 579.60 1425.00");	1800 4050.88	0.3220 8050.88	0.1770
45	disp("Economic life of the machine : 7 years");			
46	disp("For this problem, the annual equivalent total cost is minimum at the end of year 7. Therefore, the economic life of the equipment is 7 year.");			

Scilab code Exa 8.2 Find Economic Life

```
1 //Exa 8.2
2 clc;
3 clear;
4 close;
5 //Given data :
6 FC=20000;//in Rs.
7 i=15;//in % per annum
8 disp("The other details are summarized in Table 8.3.
      It can be seen from the book.");
9 disp("Total annual equivalent cost = [cumulative sum
      of PW as of beginning of year 1 of operation &
      maintenance cost + FC - PW as of beginning of
      year 1 of salvage]*(A/P,15,n)");
10 disp("In column L, the annual equivalent cost is
      minimum for n=5. Therefore, the economic life of
      the machine is 5 years. ");
```

Scilab code Exa 8.3 Determine Economic Life

```
1 //Exa 8.3
2 clc;
3 clear;
4 close;
5 //Given data :
6 FC=20000;//in Rs.
7 i=15;//in % per annum
8 disp("The details are summarized in Table 8.4. It
      can be seen from the book.");
9 disp("Total annual equivalent cost = [summation of
      PW of maintenance cost + FC]]*(A/P,15,n)");
```



```

10 disp(" (column E + Rs. 6000)* Column G");
11 disp(" Column F * Column G");
12 disp("In column H, the minimum annual equivalent
      cost occurs when n=8. Therefore , the economic
      life of the machine B is 8 years. ");
13 disp("RESULT : Min annual equivalent cost for
      machine A : Rs. 2780");
14 disp("Min annual equivalent cost for machine B : Rs.
      3672.30");

```

Scilab code Exa 8.4 Is it worth replacing the present machine

```

1 //Exa 8.4
2 clc;
3 clear;
4 close;
5 //Alternative 1: Present machine :
6 Pprice=200000;//in Rs
7 P=120000;//in Rs
8 F=25000;//in Rs
9 A=25000;//in Rs
10 i=12;//in % per annum
11 n=6;//in years
12 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
      /100)^n)-1)
13 AE1=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
      i/100+A;//in RS
14 disp(AE1,"The annual equivalent cost(AE(12%)) of
      this alternative in RS. : ");
15
16 //Alternative 2: New machine :
17 P=150000;//in Rs
18 F=20000;//in Rs
19 A=14000;//in Rs
20 i=12;//in % per annum

```

```

21 n=6; //in years
22 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
23 AE2=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
    i/100+A; //in RS
24 disp(AE2,"The annual equivalent cost(AE(12%)) of
    this alternative in RS. : ");
25 disp("Since, The equivalent cost of new machine is
    less than that of present machine, it is
    suggested that the present machine be replaced
    with the new machine.");

```

Scilab code Exa 8.5 Whether to keep or replace old engine

```

1 //Exa 8.5
2 clc;
3 clear;
4 close;
5 //Alternative 1: Old deisel Engine :
6 Pprice=50000; //in Rs
7 P=15000; //in Rs
8 F=8000; //in Rs
9 A=14000; //in Rs
10 i=15; //in % per annum
11 n=5; //in years
12 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
13 AE1=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
    i/100+A; //in RS
14 disp(AE1,"The annual equivalent cost(AE(15%)) of
    this alternative in RS. : ");
15
16 //Alternative 2: New deisel Engine :
17 P=65000; //in Rs
18 F=13000; //in Rs

```

```

19 A=9000; //in Rs
20 i=15; //in % per annum
21 n=20; //in years
22 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
23 AE2=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
    i/100+A; //in RS
24 disp(AE2,"The annual equivalent cost(AE(15%)) of
    this alternative in RS. : ");
25 disp("Since, The equivalent cost of Old deisel
    Engine is less than that of New deisel Engine, it
    is suggested to keep the Old deisel Engine.");

```

Scilab code Exa 8.6 Recommend about Reinforce or Replace existing Bridge

```

1 //Exa 8.6
2 clc;
3 clear;
4 close;
5 //Alternative 1: Reinforce the existing bridge
6 disp("Alternative 1: Reinforce the existing bridge."
    );
7 P=660000; //in Rs
8 F=400000; //in Rs
9 A=96000; //in Rs
10 i=10; //in % per annum
11 n=5; //in years
12 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
13 AE1=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
    i/100+A; //in RS
14 disp(AE1,"The annual equivalent cost(AE(10%)) of
    this alternative in RS. : ");
15
16 //Alternative 2: Replace the existing bridge by a

```

```

    new prestressed concrete bridge
17 disp(" Alternative 2: Replace the existing bridge by
    a new prestressed concrete bridge.");
18 P=150000; //in Rs
19 X=420000; //in Rs
20 i=10; //in % per annum
21 n=40; //in years
22 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
23 AE2=(P-X)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
    i/100+A; //in RS
24 disp(AE2,"The annual equivalent cost(AE(10%)) of
    this alternative in RS. : ");
25 disp(" Since , The equivalent cost of alternative 2 is
    less than that of alternative 1, it is suggested
    that alternative 2 should be selected.");
26 //Note : calculations in the book is not accurate.

```

Scilab code Exa 8.7 Find Best Alternative

```

1 //Exa 8.7
2 clc;
3 clear;
4 close;
5 //Alternative 1: Augmenting the present 10 hp motor
    with an additional 5 hp motor
6 disp(" Alternative 1: Augmenting the present 10 hp
    motor with an additional 5 hp motor.");
7 //Calculation of annual equivalent cost of 10 hp
    motor
8 P=10000; //in Rs
9 F=1500; //in Rs
10 A=1600; //in Rs
11 i=15; //in % per annum
12 n=7; //in years

```

```

13 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
14 AE1=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
    i/100+A;//in RS
15 disp(AE1,"The annual equivalent cost(AE(10%)) of 10
    hp motor in RS. : ");
16
17 //Calculation of annual equivalent cost of 5 hp
    motor
18 P=10000;//in Rs
19 F=800;//in Rs
20 A=1000;//in Rs
21 i=15;//in % per annum
22 n=7;//in years
23 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
24 AE2=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*
    i/100+A;//in RS
25 disp(AE2,"The annual equivalent cost(AE(10%)) of 10
    hp motor in RS. : ");
26 disp(AE1+AE2,"Total annual equivalent cost of
    alternative in Rs. : ");
27
28
29 //Alternative 2: Replacing the present 10 hp motor
    with a new 15 hp motor
30 disp("Alternative 2: Replacing the present 10 hp
    motor with a new 15 hp motor.");
31 P=35000;//in Rs
32 F=4000;//in Rs
33 A=500;//in Rs
34 i=15;//in % per annum
35 n=7;//in years
36 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
37 AE=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*i
    /100+A;//in RS
38 disp(AE,"The annual equivalent cost of alternative 2

```

```

    in RS. : ");
39 disp("Since , The equivalent cost of alternative 1 is
    less than that of alternative 2, it is suggested
    that the present 10 hp motor be augmented with
    an additional 5 hp motor.");
40 //Note : calculations in the book is not accurate.

```

Scilab code Exa 8.8 Find Comparative use value

```

1 //Exa 8.8
2 clc;
3 clear;
4 close;
5 //Alternative 1: Old Machine :
6 disp("Let the comparative use value of old machine
    be X.")
7 F=1000; //in Rs
8 A=7500; //in Rs
9 i=12; //in % per annum
10 n=4; //in years
11 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
12 disp("AE(12%)=(X-F)*((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)+F*i/100+A; //in RS")
13
14 //Alternative 2: New Machine :
15 P=10000; //in Rs
16 F=4000; //in Rs
17 A=500; //in Rs
18 i=15; //in % per annum
19 n=4; //in years
20 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
21 AE=(P-F)*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1)+F*i
    /100+A; //in RS

```

```

22 disp(AE,"The annual equivalent cost(AE(15%)) of n in
    RSew machine : ");
23 disp("Now equating both annual equivalent cost we
    get the X.");
24 disp("X = Rs. 7334.14");
25 disp("The comparative use value of old machine is Rs
    . 7334.14, which is less than the price(Rs. 8000)
    offered by the company which is supplying the
    new machine in the event of replacing the old
    machine by nw machine. ");
26 disp("Therefore, it is advisable to replace the old
    machine with the new one.");

```

Scilab code Exa 8.9 Find Equal Intervals for transistor replacement

```

1 //Exa 8.9
2 clc;
3 clear;
4 close;
5 //Given data :
6 p1=0.07; //unitless
7 p2=0.11; //unitless
8 p3=0.12; //unitless
9 p4=0.18; //unitless
10 p5=0.21; //unitless
11 p6=0.20; //unitless
12 p7=0.11; //unitless
13 N0=100; //no. of transistors
14 N1=N0*p1; //no. of transistors
15 N2=N0*p2; //no. of transistors
16 N3=N0*p3; //no. of transistors
17 N4=N0*p4; //no. of transistors
18 N5=N0*p5; //no. of transistors
19 N6=N0*p6; //no. of transistors
20 N7=N0*p7; //no. of transistors

```

```

21 //Calculation of individual replacement cost
22 Life=0;//in weeks
23 p=[p1 p2 p3 p4 p5 p6 p7];//Unitless
24 for i=1:7
25     Life=Life+i*p(i);
26 end
27 disp(Life,"Expected life of each transistor in weeks
      : ")
28 disp(round(100/Life),"Average No. of failures/week :
      ");
29
30 //Calculation of group replacement cost
31 disp("Cost of transistor when replaced
      simultaneously = Rs. 3");
32 disp("Cost of transistor when replaced individually
      = Rs. 9");
33 disp("The cost of group replacement policy for
      several replacement periods are summarized in
      Table 8.6. This table can be seen from the book."
      );
34 disp("From table it is clear that the avg cost/week
      is minimum for the 4th week. Hence, the group
      replacement period is 4 weeks.");
35 disp("Individual replacement cost/week = Rs. 207");
36 disp("Minimum group replacement cost/week = Rs.
      196.50");
37 disp("Since the min group replacement cost/week is
      less than the individual replacement cost/week,
      the group replacement policy is the best, and
      hence all the transistors should be replaced in 4
      weeks.")

```

Scilab code Exa 8.10 Find Optimum Replacement plan

```
1 //Exa 8.10
```



```

2  clc;
3  clear;
4  close;
5  //Given data :
6  p1=(100-96)/100; // unitless
7  p2=(96-89)/100; // unitless
8  p3=(89-68)/100; // unitless
9  p4=(68-37)/100; // unitless
10 p5=(37-13)/100; // unitless
11 p6=(13-0)/100; // unitless
12 N0=1000; //no. of resistors
13 N1=N0*p1; //no. of resistors
14 N2=N0*p2+N1*p1; //no. of resistors
15 N3=N0*p3+N1*p2+N2*p1; //no. of resistors
16 N4=N0*p4+N1*p3+N2*p2+N3*p1; //no. of resistors
17 N5=N0*p5+N1*p4+N2*p3+N3*p2+N4*p1; //no. of resistors
18 N6=N0*p6+N1*p5+N2*p4+N3*p3+N4*p2+N5*p1 ; //no. of
    resistors
19 //Calculation of individual replacement cost
20 Life=0; //in months
21 p=[p1 p2 p3 p4 p5 p6]; // Unitless
22 for i=1:6
23     Life=Life+i*p(i);
24 end
25 disp(Life,"Expected life of each transistor in
    months : ")
26 disp(round(1000/Life),"Average No. of failures/month
    : ");
27 disp(round(1000/Life)*10,"Therefore , cost of
    individual replacement in Rs. : ")
28
29
30 //Calculation of group replacement cost
31 disp("Cost/transistor when replaced simultaneously =
    Rs. 4");
32 disp("Cost/transistor when replaced individually =
    Rs. 10");
33 disp("The cost of group replacement policy for

```

```
        several replacement periods are summarized in
        Table 8.7. This table can be seen from the book."
    );
34 disp("From table it is clear that the avg cost/month
        is minimum for the 3rd month. Hence, the group
        replacement period is 3 months.");
35 disp("Individual replacement cost/month = Rs. 2480")
    ;
36 disp("Minimum group replacement cost/month = Rs.
        2426.67");
37 disp("Since the min group replacement cost/month is
        less than the individual replacement cost/month,
        the group replacement policy is the best, and
        hence all the transistors should be replaced in 3
        months.")
```

Chapter 9

Depreciation

Scilab code Exa 9.1 Determine Depreciation Charge

```
1 //Exa 9.1
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=100000; //in Rs
7 F=20000; //in Rs
8 n=8; //in years
9 Dt=(P-F)/n; //in Rs.
10 disp("In this method of depreciation , the value of
      Dt is same for all the years. The calculations
      pertaining to Bt for different values of t are
      summarized in table below : ");
11 disp("End of year          Depreciation
      Book value");
12 disp("      (t)              (Dt)              (Bt=B
      (t-1)-Dt)");
13 disp("      0
      100000");
14 disp("      1              10000
      90000");
```

```

15 disp("      2           10000
      80000");
16 disp("      3           10000
      70000");
17 disp("      4           10000
      60000");
18 disp("      5           10000
      50000");
19 disp("      6           10000
      40000");
20 disp("      7           10000
      30000");
21 disp("      8           10000
      20000");
22 disp("If we are interested in computing Dt and Bt
      for a specific period (t), the formulae can be
      used. in this approach, it should be noted that
      the depreciation is the same for all the periods.
      ");

```

Scilab code Exa 9.2 Compute Depreciation and Book value

```

1 //Exa 9.2
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=100000; //in Rs
7 F=20000; //in Rs
8 n=8; //in years
9 D5=(P-F)/n; //in Rs.
10 disp(D5,"D5 in Rs. : ");
11 disp("(This is independent of the time period)");
12 t=5; //in years
13 Bt=P-t*(P-F)/n; //in Rs

```

```
14 disp(Bt,"B5 in Rs. : ")
```

Scilab code Exa 9.3 Calculation of declining balance method

```
1 //Exa 9.3
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=100000;//in Rs
7 F=20000;//in Rs
8 n=8;//in years
9 k=0.2
10 Dt=(P-F)/n;//in Rs.
11 disp("The calculations pertaining to Dt and Bt for
      different values of t are summarized in table
      below using the formulae : ");
12 disp("Dt=k*B(t-1)");
13 disp("Bt=B(t-1)-Dt");
14
15 disp("End of year          Depreciation
      Book value");
16 disp("    (t)                (Dt)                (Bt=B
      (t-1)-Dt)");
17 disp("    0
      100000.00");
18 disp("    1                20000.00
      80000.00");
19 disp("    2                16000.00
      64000.00");
20 disp("    3                12800.00
      51200.00");
21 disp("    4                10240.00
      40960.00");
22 disp("    5                8192.00
```

```

        32768.00");
23 disp("      6                6553.60
        26214.40");
24 disp("      7                5242.88
        20971.52");
25 disp("      8                4194.
        16777.22");
26 disp("If we are interested in computing Dt and Bt
        for a specific period (t), the formulae can be
        used. in this approach, it should be noted that
        the depreciation is the same for all the periods.
        ");

```

Scilab code Exa 9.4 Compute Depreciation and Book value

```

1 //Exa 9.4
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=100000; //in Rs
7 F=20000; //in Rs
8 n=8; //in years
9 k=0.2
10 t=5; //in years
11 Dt=k*(1-k)^(t-1)*P; //in Rs.
12 disp(Dt,"D5 in Rs. : ");
13 Bt=((1-k)^t)*P; //in Rs.
14 disp(Bt,"B5 in Rs. : ")

```

Scilab code Exa 9.5 Calculations of sum of the years digits method

```

1 //Exa 9.5

```

```

2  clc;
3  clear;
4  close;
5  //Given data :
6  P=100000; //in Rs
7  F=20000; //in Rs
8  n=8; //in years
9  Sum=n*(n+1)/2; //sum of the years
10 disp("The rates for years 1-8, are respectively
      8/36,7/36,6/36,5/36,4/36,3/36,2/36,1/36");
11 disp("The calculations of Dt and Bt for different
      values of t are summarized in table below using
      the formulae : ");
12 disp("Dt=Rate*(P-F)");
13 disp("Bt=B(t-1)-Dt");
14 disp("End of year          Depreciation
      Book value");
15 disp("      (t)                (Dt)                (Bt=B
      (t-1)-Dt)");
16 disp("      0
      100000.00");
17 disp("      1                17777.77
      82222.23");
18 disp("      2                15555.55
      66666.68");
19 disp("      3                13333.33
      53333.35");
20 disp("      4                11111.11
      42222.24");
21 disp("      5                8888.88
      33333.36");
22 disp("      6                6666.66
      26666.70");
23 disp("      7                4444.44
      22222.26");
24 disp("      8                2222.22
      20000.04");
25 disp("If we are interested in computing Dt and Bt

```

for a specific period (t), then the usage of the formulae would be better.”);

Scilab code Exa 9.6 Find Depreciation and Book value

```
1 //Exa 9.6
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=100000; //in Rs
7 F=20000; //in Rs
8 n=8; //in years
9 t=5; //in years
10 Dt=(n-t+1)*(P-F)/(n*(n+1)/2); //in Rs.
11 disp(Dt,"D5 in Rs. : ");
12 Bt=(P-F)*((n-t)/n)*((n-t+1)/(n+1))+F; //in Rs.
13 disp(Bt,"B5 in Rs. : ")
```

Scilab code Exa 9.7 Calculations regarding sinking fund method

```
1 //Exa 9.7
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=100000; //in Rs
7 F=20000; //in Rs
8 n=8; //in years
9 i=12; //in % per annum
10 A=(P-F)*(i/100)/(((1+i/100)^n)-1); //in Rs.
11 disp("In this method of depreciation , a fixed amount
      of Rs. "+string(A)+" will be depreciated at the
```


end of every year from the earning of the asset.
 The depreciated amount will earn interest for the
 remaining period of life of the asset at an
 interest rate of 12 %, compounded annually.”);

```

12 disp(A," Depreciation at the end of year 1(D1) in Rs.
    : ");
13 disp(A+A*i/100," Depreciation at the end of year 2(D2
    ) in Rs. : ");
14 disp(A+(A+(A+A*i/100))*i/100," Depreciation at the
    end of year 3(D3) in Rs. : ");
15 disp("The calculations along with book values are
    summarized in table below : ");
16 disp("End of year          Fixed Depreciation
          Net Depreciation      Book value");
17 disp("      (t)                Dt(Rs.)          Bt(Rs.)
    ");
18 disp("      0                6504
    100000.00");
19 disp("      1                6504
    6504.00
    82222.23");
20 disp("      2                6504
    7284.48
    66666.68");
21 disp("      3                6504
    8158.62
    53333.35");
22 disp("      4                6504
    9137.65
    42222.24");
23 disp("      5                6504
    10324.17
    33333.36");
24 disp("      6                6504
    11462.27
    26666.70");
  
```

```

25 disp("      7                6504
           12837.74
           22222.26");
26 disp("      8                6504
           14378.27
           20000.04");

```

Scilab code Exa 9.8 Compute D5 and B7

```

1 //Exa 9.8
2 clc;
3 clear;
4 close;
5 //Given data :
6 P=100000; //in Rs
7 F=20000; //in Rs
8 n=8; //in years
9 i=12; //in % per annum
10 //Formula : (A/F, i, n) : (i/100)/(((1+i/100)^n)-1)
11 //Formula : (F/P, i, n) : (1+i/100)^n
12 //Formula : (F/A, i, n) : (((1+i/100)^n)-1)/(i/100)
13 t=5; //in Years
14 Dt=(P-F)*(i/100)/(((1+i/100)^n)-1)*(1+i/100)^(t-1);
    //in Rs.
15 disp(Dt, "D5 in Rs. : ");
16 t=7; //in Years
17 Bt=P-(P-F)*(i/100)/(((1+i/100)^n)-1)*(((1+i/100)^t)-1)/(i/100); //in Rs.
18 disp(Bt, "B7 in Rs. : ")

```

Scilab code Exa 9.9 Find Depreciation of the equipment

```

1 //Exa 9.9

```

```
2  clc;
3  clear;
4  close;
5  //Given data :
6  P=8000000; //in Rs
7  F=50000; //in Rs
8  X=75000; //in Km
9  x=2000; //in Km
10 n=8; //in years
11 i=12; //in % per annum
12 D=(P-F)*x/X; //in Rs.
13 disp(D," Depreciation for year 3 in Rs. : ");
```

Chapter 10

Evaluation of Public Alternatives

Scilab code Exa 10.1 Check Project justified based on BC ratio

```
1 //Exa 10.1
2 clc;
3 clear;
4 close;
5 //Given data
6 Ii=4000000; //in Rs.
7 AM=150000; //in Rs.
8 AFS=600000; //in Rs.
9 Einc=50000; //in Rs.
10 i=12; //in % per annum
11 n=15; //in years
12 //Total present worth of costs:
13 //Formula :  $(P/A, i, n) = \frac{((1+i/100)^n - 1)}{(i/100) * (1 + i/100)^n}$ 
14 Cp=AM*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n); //in
    Rs
15 TPW=Ii+Cp; //in RS
16 disp(TPW, "Total present worth of costs in RS. : ");
17
```

```

18 //Total present worth of fuel savings:
19 AI=600000; //in Rs.
20 G=50000; //in Rs.
21 i=12; //in % per annum
22 n=15; //in years
23 //Formula : (A/G,i,n) :(((1+i/100)^n)-i*n/100-1)/(((
    i/100)*(1+i/100)^n)-i/100)
24 A=AI+G*(((1+i/100)^n)-i*n/100-1)/(((i/100)*(1+i/100)
    ^n)-i/100); //in RS
25 Bp=A*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n); //in Rs
.
26 disp(Bp,"Present worth of fuel savings in Rs. : ");
27 BCratio=Bp/(Ii+Cp); //unitless
28 disp(BCratio,"BCratio : ");
29 disp("Since BC ratio is more than 1, the
    construction of the bridge across the river is
    justified.");

```

Scilab code Exa 10.2 Check Govt should implement the project

```

1 //Exa 10.2
2 clc;
3 clear;
4 close;
5 //Given data
6 Ic=80000000; //in Rs.
7 Aps=6000000; //in Rs.
8 Afs=3000000; //in Rs.
9 Aib=5000000; //in Rs.
10 Arb=2000000; //in Rs.
11 Amc=3000000; //in Rs.
12 i=12; //in % per annum
13 n=50; //in years
14 TAB=Afs+Aib+Arb; //in Rs.
15 //Present worth of Benefit:

```

```

16 //Formula : (P/A,i,n)=(((1+i/100)^n)-1)/((i/100)*(1+
    i/100)^n)
17 PW_B=TAB*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n);//
    in Rs
18 disp(PW_B,"Total present worth of benefits in Rs. :
    ");
19
20 //Present worth of costs:
21 //Formula : (P/A,i,n) : (((1+i/100)^n)-1)/((i/100)
    *(1+i/100)^n)
22 PW_C=Ic+Amc*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n)-
    Aps*(((1+i/100)^n)-1)/((i/100)*(1+i/100)^n);//in
    RS
23 disp(PW_C,"Present worth of costs in Rs. : ");
24 BCratio=PW_B/PW_C;//unitless
25 disp(BCratio,"BCratio : ");
26 disp("Since BC ratio is more than 1, the state govt.
    can implement the hydroelectric project.");

```

Scilab code Exa 10.3 Which Project would you select using BC ratio

```

1 //Exa 10.3
2 clc;
3 clear;
4 close;
5 //Alternative A1 :
6 disp("Alternative A1 :")
7 P=3000000;//in Rs.
8 B=900000;//in Rs.
9 i=10;//in % per annum
10 n=5;//in years
11 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
12 AE1=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1);//in
    Rs

```

```

13 disp(AE1,"Annual equivalent of initial cost in Rs. :
    ");
14 BCratio=B/AE1;// unitless
15 disp(BCratio,"BCratio : ");
16
17 //Alternative A2 :
18 disp("Alternative A2 :")
19 P=6000000;//in Rs.
20 B=1500000;//in Rs.
21 i=10;//in % per annum
22 n=7;//in years
23 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
24 AE2=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1);//in
    Rs
25 disp(AE2,"Annual equivalent of initial cost in Rs. :
    ");
26 BCratio=B/AE2;// unitless
27 disp(BCratio,"BCratio : ");
28 disp("The benefit cost ratio of alternative 2 is
    more than that of alternative A1. Hence,
    alternative A2 is to be selected. The comparisoon
    is made on a 35 years period which is the
    minimum common multiple of the lives of
    alternative 1 and 2");

```

Scilab code Exa 10.4 Find BC ratio

```

1 //Exa 10.4
2 clc;
3 clear;
4 close;
5 //Cost to the state :
6 disp("Cost to the state :")
7 n=20;//in years

```

```

8 P=2500000000; //in Rs.
9 Agt=10000000; //in Rs.
10 Ai=1000000; //in Rs.
11 Com=48000; //in Rs./year/employee
12 C1=Com*300; //in Rs.
13 i=10; //in % per annum
14 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
15 C2=P*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1); //in Rs
16 disp(C2,"Annual equivalent initial cost in Rs. : ");
17 CA=C2+C1; //in Rs
18 disp(CA,"Total Annual equivalent cost of the project
    in Rs. : ");
19 //Benefit to the state :
20 disp("Benefit to the state :")
21 W=30000000; //in Rs.
22 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
23 A1=W*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1); //in Rs
    .
24 Agpy=10000000; //in ton/year
25 A2=Agpy*(30-10); //in Rs.
26 AvgAI=1000000; //in tons Km.
27 G=20000000; //in Rs.
28 //Formula : (A/G,i,n) : (((1+i/100)^n)-i*n/100-1)/(((
    i/100)*(1+i/100)^n)-i/100)
29 A3=A2+G*(((1+i/100)^n)-i*n/100-1)/(((i/100)*(1+i
    /100)^n)-i/100) ; //in Rs.
30 disp(A3,"Annual equivalent average of transport cost
    saving in Rs. : ");
31 BA=A1+A3; //in Rs.
32 disp(BA,"Total annual equivalent benefits to the
    state : ");
33 BCratio=BA/CA; //unitless
34 disp(BCratio,"BCratio : ");
35 disp("The benefit cost ratio is more than 1,the
    project is justified.");

```


Scilab code Exa 10.5 Which Project should be selected

```
1 //Exa 10.5
2 clc;
3 clear;
4 close;
5 i=9;//% per annum
6 n=50;//in years
7 //Project A :
8 disp("Project A : ");
9 P_A=150000000;//in Rs.
10 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
11 AE_A=P_A*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1);
12 OMC_A=2000000;//in Rs.
13 Psy_A=10000000;//in Rs.
14 Cpy_A=AE_A+OMC_A-Psy_A;//in Rs.
15 disp(Cpy_A,"Costs/year : ");
16 Fcs_A=2500000;//in Rs.
17 Ib_A=3500000;//in Rs.
18 Rb_A=1000000;//in RS.
19 Bpy_A=Fcs_A+Ib_A+Rb_A;//in Rs.
20 disp(Bpy_A,"Benefits/year : ");
21 BCratio_A=Bpy_A/Cpy_A;//unitless
22 disp(BCratio_A,"BC Ratio of project A : ")
23 //Project B :
24 disp("Project B : ");
25 P_B=250000000;//in Rs.
26 //Formula : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
27 AE_B=P_B*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1);
28 OMC_B=2500000;//in Rs.
29 Psy_B=12000000;//in Rs.
30 Cpy_B=AE_B+OMC_B-Psy_B;//in Rs.
```

```

31 disp(Cpy_B," Costs/year : ");
32 Fcs_B=3500000; //in Rs.
33 Ib_B=4500000; //in Rs.
34 Rb_B=2000000; //in RS.
35 Bpy_B=Fcs_B+Ib_B+Rb_B; //in Rs.
36 disp(Bpy_B," Benefits/year : ");
37 BCratio_B=Bpy_B/Cpy_B; // unitless
38 disp(BCratio_B,"BC Ratio of project B : ")
39 //Project C :
40 disp("Project C : ");
41 P_C=400000000; //in Rs.
42 //FormulC : (A/P,i,n) : ((i/100)*(1+i/100)^n)/(((1+i
    /100)^n)-1)
43 AE_C=P_C*((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1);
44 OMC_C=3500000; //in Rs.
45 Psy_C=18000000; //in Rs.
46 Cpy_C=AE_C+OMC_C-Psy_C; //in Rs.
47 disp(Cpy_C," Costs/year : ");
48 Fcs_C=5000000; //in Rs.
49 Ib_C=6000000; //in Rs.
50 Rb_C=3500000; //in RS.
51 Bpy_C=Fcs_C+Ib_C+Rb_C; //in Rs.
52 disp(Bpy_C," Benefits/year : ");
53 BCratio_C=Bpy_C/Cpy_C; // unitless
54 disp(BCratio_C,"BC Ratio of project C : ")
55 disp("From the computations it is clear that only
    alternative A is eligible because other two
    alternatives have BC ratio less than one.")

```

Chapter 11

Inflation Adjusted Decisions

Scilab code Exa 11.1 What Equal Amount should he save

```
1 //Exa 11.1
2 clc;
3 clear;
4 close;
5 disp("Few steps are as follows : ");
6 disp("Step 1 : The estimated future requirementt per
   year in terms of todays rupees from his age 61
   through 70 is Rs. 24000.");
7 disp("Step 2 : The formula which is given below is
   used to get future equivalent of Rs. 24000 with
   the inflation of 9% per year.");
8 disp("Formula :  $P*(1+IR)^n$ ");
9 P=24000;//in Rs.
10 IR=9;//in % per year
11 Age=61;//in years
12 for n=21:30
13     IV=P*(1+IR/100)^n;//in Rs
14     disp("Age in years : "+string(Age)+" . ""Inflated
   value of Rs. 24000 at end of year : "+string
   (n)+" in Rs. "+string(round(IV)));
15     Age=Age+1;//in Years
```

```

16 end;
17 PW=0; //For initialising
18 n=21; //in years
19 for m=1:10
20     IV=P*(1+IR/100)^n; //in Rs
21     n=n+1;
22     i=15; //in % per year
23     PW=PW+IV/(1+i/100)^m;
24 end
25 disp(PW,"Present equivalent of withdrawls in Rs. : ")
    );
26 //The annual equivalent amount :
27 i=15; //in % per year
28 n=20; //in years
29 //Formula : (A/F,i,n) : (i/100)/(((1+i/100)^n)-1)
30 A=PW*(i/100)/(((1+i/100)^n)-1); //in Rs.
31 disp(A,"The annual equivalent amount in Rs. : ");
32 disp("RECOMMENDATION : The person has to invest an
    amount of Rs. "+string(A)+" at the end of every
    year starting from his age 41 through 60 which
    will enable him to make a withdrawl at the end of
    every year starting from his age 61 through 70."
    );

```

Scilab code Exa 11.2 Find Economic Life

```

1 //Exa 11.2
2 clc;
3 clear;
4 close;
5 disp("The method of finding the economic life of the
    machine witha discounting factor of 20% at zero
    inflation rate is summarized in table below. From
    the table it is clear that total annual cost is
    minimum if the machine is used for 14 years.

```

```

        Hence the economic life of the machine is 14
        years.");
6  disp("End of year      Op_cost      Main_cost      Op+
      Main      P/F,i,n      PW      Cummulative
      Salvage      PW_S      TPW      A/P,i,n      AEM");
7  i=20; //in per year
8  Cum=0; //initialising
9  Op_cost=40000; //in Rs.
10 Main_cost=60000; //in Rs.
11 OpMain=Op_cost+Main_cost; //in Rs.
12 S=400000; //in Rs.
13 for n=1:15
14     PF=1/((1+i/100)^n);
15     PW=OpMain*PF; //in Rs.
16     Cum=Cum+PW
17     PW_S=PF*S; //in Rs.
18     TPW=500000+Cum-PW_S; //in Rs.
19     AP=((i/100)*(1+i/100)^n)/(((1+i/100)^n)-1);
20     AEM=TPW*AP; //in Rs
21     disp("      "+string(n)+"      "+string(
          Op_cost)+"      "+string(Main_cost)+"
          "+string(OpMain)+"      "+string(PF)+"
          "+string(PW)+"      "+string(Cum)+"
          "+string(S)+"      "+string(PW_S)+"
          "+string(TPW)+"      "+string(AP)+"
          "+string(AEM));
22     Op_cost=Op_cost+5000; //in Rs.
23     Main_cost=Main_cost+6000; //in Rs.
24     S=S-50000; //in Rs.
25 end

```

Scilab code Exa 11.3 Determine the best machine based on Present Worth

```

1 //Exa 11.3
2 clc;

```

```

3 clear;
4 close;
5 IR=5; //in % per year
6 i=15; //in % per year
7 //Machine X :
8 disp("Machine X : ");
9 Ppx=1500000; //in Rs.
10 n=7; //in years
11 S=200000; //in Rs.
12 AMC=300000; //in Rs.
13 disp("End of year      AMC      InflationFactor
      InflatedAmount    P/F      PW");
14 format('v',9)
15 Pw=0; //For initialising
16 for n=1:7
17     FP=(1+IR/100)^n
18     IA=AMC*FP; //in Rs.
19     PF=1/((1+i/100)^n);
20     PW=IA*PF; //in Rs.
21     Pw=Pw+PW; //in Rs.
22     disp("          "+string(n)+"          "+string(AMC)+"
          "+string(FP)+"          "+string(IA)
          +          "+string(PF)+"          "+string(PW))
          ;
23 end
24 disp(Pw,"Present worth of inflated annual operating
      and maintenance cost in Rs. : ");
25 PWX=Ppx+Pw-S*1/((1+i/100)^n);
26 disp(PWX,"Present worth of machine X in Rs. : ");
27 //Machine Y
28 disp("Machine Y : ");
29 Ppy=2000000; //in Rs.
30 n=7; //in years
31 S=300000; //in Rs.
32 AMC=250000; //in Rs.
33 disp("End of year      AMC      InflationFactor
      InflatedAmount    P/F      PW");
34 format('v',9)

```

```

35 Pw=0; //For initialising
36 for n=1:7
37     FP=(1+IR/100)^n
38     IA=AMC*FP; //in Rs.
39     PF=1/((1+i/100)^n);
40     PW=IA*PF; //in Rs.
41     Pw=Pw+PW; //in Rs.
42     disp("          "+string(n)+"          "+string(AMC)+"
          "+string(FP)+"          "+string(IA)
          + "          "+string(PF)+"          "+string(PW))
          ;
43 end
44 disp(Pw,"Present worth of inflated annual operating
      and maintenance cost in Rs. : ");
45 PWY=Ppy+Pw-S*1/((1+i/100)^n);
46 disp(PWY,"Present worth of machine Y in Rs. : ");
47 disp("Since the present worth of Machine X is less
      than Machine Y, select Machine X")
48 //Note : Calculations are not accurate in the book

```

Scilab code Exa 11.4 Find the single deposit

```

1 //Exa 11.4
2 clc;
3 clear;
4 close;
5 IR=6; //in % per year
6 i=18; //in % per year
7 AFR=5000000; //in Rs.
8 n=7; //in years
9 AI=500000; //in Rs.
10 disp("End of year      AFR      InflationFactor
      InflatedAmount      P/F      PW");
11 TPW=0; //Initialising
12 format('v',10)

```

```

13 for n=1:5
14     IF=(1+IR/100)^n;
15     IA=IF*AFR; //in Rs.
16     PF=1/((1+i/100)^n);
17     PW=PF*IA; //in Rs.
18     TPW=PW+TPW; //in Rs.
19     disp("          "+string(n)+"          "+string(AFR)+
           "          "+string(IF)+"          "+string(IA)+"
           "+string(PF)+"          "+string(PW));
20     AFR=AFR+AI; //in Rs.
21 end;
22 disp(TPW,"The value of the single deposit to be made
        now to recieve the specified series for the next
        five years is Rs. : ")

```

Chapter 12

Inventory Control

Scilab code Exa 12.1 Economic Order Quantity and Orders per year

```
1 //Exa 12.1
2 clc;
3 clear;
4 close;
5 //given data :
6 D=24000;//in units/year
7 Co=150;//in Rs./order
8 Pprice=75;//Rs./unit
9 Cpupy=18;//in % of Pprice/unit
10 Cc=Pprice*Cpupy/100;//in Rs.
11 EOQ=sqrt((2*Co*D)/Cc);//in units
12 disp(round(EOQ),"Economic order quantity in units :
    ");
13 n=D/round(EOQ);//no. of orders/year
14 disp(n,"No. of orders/year : ");
15 T=round(EOQ)/D;// time between successive orders in
    year
16 T=T*12;//in months
17 T=T*30;//in Days
18 disp(round(T),"Time between successive orders in
    days : ");
```

Scilab code Exa 12.2 Find EOQ and cycle time

```
1 //Exa 12.2
2 clc;
3 clear;
4 close;
5 //given data :
6 r=12000;//in units/year
7 k=24000;//in units/year
8 Co=175;//in Rs./setup
9 Cc=15;//in Rs./unit/year
10 EOQ=sqrt((2*Co*r)/(Cc*(1-r/k)));//in units
11 Q=ceil(EOQ);//units
12 disp(Q,"Economic order quantity in units : ");
13 t1=Q/k;//in year
14 t1=t1*12*30;//in days
15 t2=(Q/r)*(1-r/k);//in year
16 t2=t2*12*30;//in days
17 disp(round(t1+t2),"Cycle time in days :");
18 disp(r/Q,"No. of setups/year : ");
```

Scilab code Exa 12.3 Find Optimum Values of various parameter

```
1 //Exa 12.3
2 clc;
3 clear;
4 close;
5 //given data :
6 D=30000;//in units/year
7 Cc=2;//in Rs./unit/year
8 Co=100;//in Rs./orde
```

```

 9 Cs=12; //in units/year
10 EOQ=sqrt(2*Co*D*(Cs+Cc)/(Cc*Cs)); //in units
11 Q=round(EOQ); //units
12 disp(Q,"Ordering quantity in units : ");
13 Q1=sqrt(2*Co*D*Cs/(Cc*(Cs+Cc))); //in units
14 disp(round(Q1),"Maximum Inventory in units : ");
15 disp(round(Q-Q1),"Maximum shortage quantity in units
      : ");
16 t=Q/D; //in year
17 t=t*365; //in days
18 disp(round(t),"Cycle time in days: ");
19 t1=Q1/D; //in year
20 t1=t1*365; //in days
21 disp(round(t1),"Inventory period(t1) in days : ");
22 t2=t-t1; //in days
23 disp(round(t2),"Shortage period(t2) in days : ");
24 disp(D/Q,"No. of Orders/year : ");

```

Scilab code Exa 12.4 Find Various parameter of Inventory System

```

1 //Exa 12.4
2 clc;
3 clear;
4 close;
5 //given data :
6 r=12000; //in units/year
7 k=2000*12; //in units/year
8 Co=400; //in Rs./setup
9 Cc=0.20*12; //in Rs./year
10 Cs=15; //in Rs./unit/year
11
12 EOQ=sqrt((2*Co*k*r*(Cc+Cs)/(Cc*(k-r)*Cs)); //in
      units
13 Q=round(EOQ); //units
14 disp(Q,"Ordering quantity in units : ");

```

```

15
16 Q1=sqrt(2*Co*Cc*r*(k-r)/(Cs*(Cc+Cs)*k)); //in units
17 disp(round(Q1),"Maximum Inventory in units : ");
18 Q2=(Q*(k-r)/k)-Q1; //in Units
19 disp(round(Q2),"Maximum shortage quantity in units :
    ");
20 t=Q/r; //in year
21 t=t*365; //in days
22 disp(round(t),"Cycle time in days: ");
23 t1=(Q2/r)*365; //in days
24 t2=(Q2/(k-r))*365; //in days
25 t3=(Q1/(k-r))*365; //in days
26 t4=(Q1/r)*365; //in days
27 disp(round(t1),"Period of shortage in days : ");
28 disp(round(t2),"Period of production satisfying back
    order in days : ");
29 disp(ceil(t3),"Period of production satisfying
    period requirement in days : ");
30 disp(ceil(t4),"Period of consumption only in days :
    ");

```

Chapter 13

Make or Buy Decision

Scilab code Exa 13.1 Would it be profitable to make fixtures

```
1 //Exa 13.1
2 clc;
3 clear;
4 close;
5 //Cost to make :
6 disp("Cost to make : ")
7 //given data :
8 material=300;//in Rs.
9 labour=250;//in Rs.
10 overhead=100;//in Rs.
11 VC=material+labour+overhead;//in Rs.
12 demand=5000;//in units
13 TVC=demand*VC;//in Rs.
14 FC=1000000;//in Rs.
15 TC=FC+TVC;//in Rs.
16 disp(TC,"Total cost in Rs. : ");
17
18 //Cost to buy :
19 disp("Cost to buy : ")
20 //given data :
21 Pcost=900*demand;//in Rs.
```

```

22 FC=1000000; //in Rs.
23 TC=FC+Pcost; //in Rs.
24 disp(TC,"Total cost in Rs. : ");
25 disp("The cost of making fixtures is less than the
      cost of buying fixtures from outside. Therefore,
      the organisation should make the fixtures.")

```

Scilab code Exa 13.2 Determine Best Option

```

1 //Exa 13.2
2 clc;
3 clear;
4 close;
5 //Buy Option :
6 disp("Buy Option :")
7 //given data :
8 Pbuy=8; //in Rs/unit
9 D=2000; //in units/year
10 Co=120; //in Rs./order
11 Cc=1.60; //in Rs./units/year
12 Q1=sqrt(2*Co*D/Cc); //in units
13 TC=D*Pbuy+D*Co/Q1+Q1*Cc/2; //in Rs.
14 disp(TC,"Total cost of buying in Rs. : ")
15 //Make Option :
16 disp("Make Option :")
17 //given data :
18 Pmake=5; //in Rs/unit
19 Co=60; //in Rs./setup
20 Cc=1; //in Rel/units/year
21 r=2000; //in units/year
22 k=8000; //in units/year
23 Q2=sqrt(2*Co*r/(Cc*(1-r/k))); //in units
24 TC=D*Pmake+D*Co/Q2+Q2*Cc*(k-r)/(2*k); //in Rs.
25 disp(TC,"Total cost of making in Rs. : ")
26 disp("The cost of making is less than the cost of

```

buying . Therefore , the firm should go in for making option.”);

Scilab code Exa 13.3 Should the manufacturer make or buy the cabinet

```
1 //Exa 13.3
2 clc;
3 clear;
4 close;
5 //given data :
6 SP=500;//in Rs.
7 VC=300;//in Rs.
8 FC=400000;//in RS.
9 BEP=FC/(SP-VC);//in units
10 disp(BEP,"BEP in units : ");
11 disp(" Since the demand(1500 units) is less than the
      break even quantity , the company should buy the
      cabinets for its TV production.")
```

Scilab code Exa 13.4 Should the company make or buy the product

```
1 //Exa 13.4
2 clc;
3 clear;
4 close;
5 //given data :
6 volume=8000;//in units
7 //Process A :
8 disp(" Process A :");
9 FC=500000;//in RS.
10 VC=175;//in Rs.
11 AC=FC+VC*volume;//in Rs.
12 disp(AC," Annual Cost of Process A in Rs. :");
```

```
13
14 //Process B :
15 disp("Process B :");
16 FC=600000; //in RS.
17 VC=150; //in Rs.
18 AC=FC+VC*volume; //in Rs.
19 disp(AC,"Annual Cost of Process A in Rs. :");
20
21 //Buy option:
22 disp("Buy Option :");
23 Pprice=125; //in RS./Unit
24 VC=175; //in Rs.
25 AC=Pprice*volume; //in Rs.
26 disp(AC,"Annual Cost of Buy in Rs. :");
27 disp("Since the annual cost of buy option is the
      minimum among all the alternatives , the company
      should buy the product.")
```

Chapter 16

Linear Programming

Scilab code Exa 16.1 Formulate Linear Programming Model

```
1 //Exa 16.1
2 clc;
3 clear;
4 close;
5 //given data :
6 disp("The data of the problem are summarized below :
      ");
7 disp("Machine                Products
      Limit on ");
8 disp("                P1                P2
      machine hours");
9 disp("Lathe                5                10
      60");
10 disp("Milling                4                4
      40");
11 disp("Profit/unit                6                8");
12 disp("Let X1 be the production volume of the product
      .P1, and");
13 disp("X2 be the production volume of the product ,P2.
      ");
14 disp("The corresponding linear programming model to
```

```

        determine the production volume of each product
        such that the total profit is maximized is as
        shown below : ");
15 disp("maximize Z = 6*X1 + 8*X2");
16 disp("subject to");
17 disp("5*X1+10*X2 <= 60");
18 disp("4*X1+4*X2 <= 40");
19 disp("X1,X2 >= 0");

```

Scilab code Exa 16.2 Determine Optimal combination of food types

```

1 //Exa 16.2
2 clc;
3 clear;
4 close;
5 //given data :
6 disp("Let X1 be the No. of packets of food type1
       suggested for babies , and");
7 disp("X2 be the No. of packets of food type1
       suggested for babies.");
8 disp("The corresponding linear programming model to
       determine the No. of packets of each food type to
       be suggested for babies with the minimum cost
       such that the minimum daily required vitamin in
       each food type is satisfied is as shown below : "
       );
9 disp("maximize Z = 2*X1 + 3*X2");
10 disp("subject to");
11 disp("X1+X2 >= 6");
12 disp("7*X1+X2 >= 14");
13 disp("X1,X2 >= 0");

```

Scilab code Exa 16.3 Solve LP problem

```

1 //Exa 16.3
2 clc;
3 clear;
4 close;
5 //given data :
6 disp("Given the following LP model :")
7 disp("maximize Z = 6*X1 + 8*X2");
8 disp("subject to");
9 disp("5*X1+10*X2 <= 60");
10 disp("4*X1+4*X2 <= 40");
11 disp("X1,X2 >= 0");
12 disp("The introduction of non-negative constraints
      X1>=0 and X2>=0 will eliminate the 2nd, 3rd and 4
      th quadrants of XY plane.");
13 disp("Compute the cordinates to plot equations
      relting to the constraints on the XY plane as
      shown below : ");
14 disp("5*X1+10*X2 <= 60");
15 disp("When X1=0 : X2=6");
16 disp("When X2=0 : X1=12");
17 X1=0:12;
18 X2=(60-5*X1)/10;
19 plot2d(X1,X2);
20 disp("Consider the 2nd constraint in the form :");
21 disp("4*X1+4*X2 <= 40");
22 disp("When X1=0 : X2=10");
23 disp("When X2=0 : X1=10");
24 X1=0:10;
25 X2=(40-4*X1)/4;
26 plot2d(X1,X2);
27 disp("The closed polygon is the feasible region at
      each of the corner points of the closed polygon
      is computed as follows by substituting its
      coordinates in the objective function :");
28 ZA=6*0+8*0;
29 ZB=6*10+8*0;
30 ZC=6*8+8*2;
31 ZD=6*0+8*6;

```

```

32 disp("ZA=6*0+8*0=0...
33     ZB=6*10+8*0=60...
34     ZC=6*8+8*2=64...
35     ZD=6*0+8*6=48");
36 disp("Since the type of the objective function is
      maximization , the solution corresponding to the
      maximum Z value should be selected as the optimum
      solution. The Z value is maximum for the corner
      point C. Hence, the corresponding solution is ");
37 disp("X1 = 8  X2 = 2 and Z(Optimum) = 64");

```

Scilab code Exa 16.4 Solve LP problem

```

1 //Exa 16.4
2 clc;
3 clear;
4 close;
5 //given data :
6 disp("Given the following LP model :")
7 disp("minimize Z = 2*X1 + 3*X2");
8 disp("subject to");
9 disp("X1+X2 >= 6");
10 disp("7*X1+X2 >= 14");
11 disp("X1,X2 >= 0");
12 disp("The introduction of non-negative constraints
      X1>=0 and X2>=0 will eliminate the 2nd, 3rd and 4
      th quadrants of XY plane.");
13 disp("Compute the coordinates to plot equations
      relating to the constraints on the XY plane as
      shown below : ");
14 disp("X1+X2 = 6");
15 disp("When X1=0 : X2=6");
16 disp("When X2=0 : X1=6");
17 X1=0:6;
18 X2=(6-X1);

```

```

19 plot2d(X1,X2);
20 disp(" Consider the 2nd constraint in the form :");
21 disp("7*X1+X2 = 14");
22 disp("When X1=0 : X2=14");
23 disp("When X2=0 : X1=2");
24 X1=0:2;
25 X2=(14-7*X1);
26 plot2d(X1,X2);
27 disp("The Optimum solution will be in any one of the
      corners A, B and C");
28 disp("The objective function value at each of these
      corner points of the feasible solution space is
      computed as follows by substituting its
      coordinates in the objective function.")
29 ZA=2*0+3*14;
30 ZB=2*(4/3)+3*(14/3);
31 ZC=2*6+3*0;
32 disp("ZA=6*0+8*0=0...
33     ZB=6*10+8*0=60...
34     ZC=6*8+8*2=64");
35 disp("Since the type of the objective function is
      minimization, the solution corresponding to the
      minimum Z value should be selected as the optimum
      solution. The Z value is minimum for the corner
      point C. Hence, the corresponding solution is ");
36 disp("X1 = 6  X2 = 0 and Z(Optimum) = 12");

```

Scilab code Exa 16.5 Solve LP model

```

1 //Exa 16.3
2 clc;
3 clear;
4 close;
5 //given data :
6 disp("Given the following LP model :")

```

```

7 disp("maximize Z = 6*X1 + 8*X2");
8 disp("subject to");
9 disp("5*X1+10*X2 <= 60");
10 disp("4*X1+4*X2 <= 40");
11 disp("X1,X2 >= 0");
12 disp("The canonical form of the above LP problem is
:");
13 disp("maximize Z = 6*X1 + 8*X2 + 0*S1 + 0*S2");
14 disp("subject to");
15 disp("5*X1+10*X2+S1 = 60");
16 disp("4*X1+4*X2+S2 = 40");
17 disp("X1,X2,S1,S2 >= 0");
18 disp("S1, S2 are slack variables.");
19 disp("The initial simplex table of the above problem
is shown in table below : ");
20 disp("Cj          Cj          6          8
0          0");
21 disp("          Basic Variable      X1          X2
S1          S2          Solution      Ratio");
22 disp(" 0          S1          5          10
1          0          60          60/10=6**"
);
23 disp(" 0          S2          4          4
0          1          40          40/4=10");
24 disp("          Zj          0          0
0          0          0");
25 disp("          Cj-Zj          6          8*
0          0");
26 disp("* key column          ** key row");
27 disp("The value at the intersection of the keyrow
and key column is called the key element.");

```

Scilab code Exa 16.6 Solve LP model using simplex method

```
1 //Exa 16.6
```

```

2  clc;
3  clear;
4  close;
5  //given data :
6  disp("Given the following LP model :")
7  disp("minimize Z = 2*X1 + 3*X2");
8  disp("subject to");
9  disp("X1+X2 >= 6");
10 disp("7*X1+X2 >= 14");
11 disp("X1, X2 >= 0");
12 disp("Standard Form : The standard form of the above
      model is as follows :");
13 disp("minimize Z = 2*X1 + 3*X2");
14 disp("subject to");
15 disp("X1+X2-S1 >= 6");
16 disp("7*X1+X2-S2 >= 14");
17 disp("X1, X2, S1, S2 >= 0");
18 disp("S1, S2 are surplus variables which are
      introduced to balance the constraints.");
19 disp("Canonical Form : The Canonical form of the
      above model is as follows :");
20 disp("minimize Z = 2*X1 + 3*X2 + M1*R1 + M2*R2");
21 disp("subject to");
22 disp("X1+X2-S1+R1 >= 6");
23 disp("7*X1+X2-S2+R2 >= 14");
24 disp("X1, X2, S1, S2, R1, R2 >= 0");
25 disp("R1, R2 are artificial variables which are
      introduced to have basic variables in each of the
      constraints.");
26
27 disp("The initial simplex table of the above problem
      is shown in table below : ");
28 disp("CBi          Cj          2          3
      0          0          M          M'");
29 disp("          Basic Variable  X1          X2
      S1          S2          R1          R2
      Solution          Ratio");
30 disp("M          R1          1          1

```

```

31 disp(" M      -1      0      1      0
      6      R2      6");
32 disp("      0      -1      0      1
      14      2**");
33 disp("      -M      -M      M      M
      20M");
34 disp("      M      Cj-Zj      2-8*M      3-2*M
      M      M      0      0");
35 disp(" * key column      ** key row");
35 disp("The value at the intersection of the keyrow
      and key column is called the key element.");

```
