FALL SEM – (20 -2021)

MAT2003

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LAB NO : 6

SLOT : L6

1. Egg contains 6 units A and 7 units of B per gram and costs 12 paise per gram Milk contains 8 units of vitamin A and 12 units of Vitamin B and costs 20 paise per gram. The daily minimum requirement of vitamin A and vitamin B are 100 units and 120 units respectively. Find the optimal product mix. (Hint: Let x1 and x2 are the number of units of egg and milk)

CODE:

```
format short
clear all
clc
coltxt = {'x1','x2','s1','s2','sol'};
cost = input('Enter the cost matrix :');
info = input('Enter the matrix of basic and nonbasic variables :');
b = input('Enter the solution matrix :');
s = eye(size(info,1));
A = [info s b];
BV = [];
for j = 1:size(s,2)
    for i = 1:size(A,2)
        if A(:,i)==s(:,j)
            BV = [BV i];
        end
    end
end
fprintf('Basic Variables (BV) = ');
disp(coltxt(BV));
ZjCj = cost(BV)*A - cost;
ZCj = [ZjCj;A];
simpTable = array2table(ZCj);
simpTable.Properties.VariableNames(1:size(ZCj,2))=coltxt;
disp(simpTable);
RUN =true;
```

```
while RUN
SOL = A(:,end);
if any(SOL<0)
    fprintf("The current solution is not feasible\n");
    [LeaVal,pvt_row]=min(SOL);
    fprintf("Leaving row = %d\n",pvt_row);
    ROW = A(pvt_row,1:end-1);
    ZJ =ZjCj(:,1:end-1);
    for i = 1:size(ROW,2)
        if ROW(i)<0
            ratio(i)=abs(ZJ(i)./ROW(i));
        else
            ratio(i) = inf;
        end
    end
    [minVAL,pvt_col] = min(ratio);
    fprintf("Entering variable = %d\n",pvt_col);
    BV(pvt_row) = pvt_col;
    fprintf("Basic Variables (BV) = ");
    disp(coltxt(BV));
    pvt_key = A(pvt_row,pvt_col);
    A(pvt_row,:)=A(pvt_row,:)./pvt_key;
    for i = 1:size(A,1)
        if i~=pvt_row
            A(i,:) = A(i,:)-A(i,pvt_col).*A(pvt_row,:);
        end
    end
    ZjCj = cost(BV)*A - cost;
    ZCj = [ZjCj;A];
    simpTable = array2table(ZCj);
    simpTable.Properties.VariableNames(1:size(ZCj,2))=coltxt;
    disp(simpTable)

else
    RUN =false;
    fprintf("The current solution is feasible and optimal\n");
end
end
Final_BFS = zeros(1,size(A,2));
Final_BFS(BV) =A(:,end);
Final_BFS(end)=sum(Final_BFS.*cost);
OptimalBFS=array2table(Final_BFS);
OptimalBFS.Properties.VariableNames(1:size(OptimalBFS,2))=coltxt;
disp(OptimalBFS);
```

OUTPUT:

```
Enter the cost matrix :
[12 20 0 0 0]
Enter the matrix of basic and nonbasic variables :
[-6 -8;-7 -12]
Enter the solution matrix :
[-100;-120]
Basic Variables (BV) =     {'s1'}    {'s2'}

    x1     x2     s1    s2    sol
    ___    ___    __    __    ____


    -12    -20    0     0       0
     -6     -8    1     0    -100
     -7    -12    0     1    -120


The current solution is not feasible
Leaving row = 2
Entering variable = 2
Basic Variables (BV) =     {'s1'}    {'x2'}

       x1       x2    s1       s2        sol
    ________    __    __    _________    ___


    -0.33333    0     0       -1.6667    200
     -1.3333    0     1      -0.66667    -20
     0.58333    1     0     -0.083333     10


The current solution is not feasible
Leaving row = 1
Entering variable = 1
Basic Variables (BV) =     {'x1'}    {'x2'}

    x1    x2      s1        s2      sol
    __    __    ______    ______    ____


    0     0      -0.25      -1.5     205
    1     0      -0.75       0.5      15
    0     1     0.4375    -0.375    1.25
```

The current solution is feasible and optimal

x1	x2	s1	s2	sol
15	1.25	0	0	205

2. An animal food company at least produce 200kg of ingredients x1 and x2 daily. x1 costs Rs.3 per kg and x2 Rs. 8 per kg. Not more than 80 kg of x1 can be used and at least 60kg of x2 must be used. Formulate the LP model to minimize the cost and compute the optimal cost. (Hint: Let x1 and x2 are the ingredients in the mixture as expressed in kg.)

CODE:

```
format short
clear all
clc
coltxt = {'x1','x2','s1','s2','s3','sol'};
cost = input('Enter the cost matrix :');
info = input('Enter the matrix of basic and nonbasic
variables :');
b = input('Enter the solution matrix :');
s = eye(size(info,1));
A = [info s b];
BV = [];
for j = 1:size(s,2)
    for i = 1:size(A,2)
        if A(:,i)==s(:,j)
            BV = [BV i];
        end
    end
end
fprintf('Basic Variables (BV) = ');
disp(coltxt(BV));
ZjCj = cost(BV)*A - cost;
ZCj = [ZjCj;A];
simpTable = array2table(ZCj);
simpTable.Properties.VariableNames(1:size(ZCj,2))=coltxt;
disp(simpTable);
RUN =true;
while RUN
SOL = A(:,end);
if any(SOL<0)
    fprintf("The current solution is not feasible\n");
    [LeaVal,pvt_row]=min(SOL);
```

```
    fprintf("Leaving row = %d\n",pvt_row);
    ROW = A(pvt_row,1:end-1);
    ZJ =ZjCj(:,1:end-1);
    for i = 1:size(ROW,2)
        if ROW(i)<0
            ratio(i)=abs(ZJ(i)./ROW(i));
        else
            ratio(i) = inf;
        end
    end
    [minVAL,pvt_col] = min(ratio);
    fprintf("Entering variable = %d\n",pvt_col);
BV(pvt_row) = pvt_col;
fprintf("Basic Variables (BV) = ");
disp(coltxt(BV));
pvt_key = A(pvt_row,pvt_col);
A(pvt_row,:)=A(pvt_row,:)./pvt_key;
for i = 1:size(A,1)
if i~=pvt_row
A(i,:) = A(i,:)-A(i,pvt_col).*A(pvt_row,:);
end
end
ZjCj = cost(BV)*A - cost;
ZCj = [ZjCj;A];
simpTable = array2table(ZCj);
simpTable.Properties.VariableNames(1:size(ZCj,2))=coltxt;
disp(simpTable)
else
RUN =false;
fprintf("The current solution is feasible and optimal\n");
end
end
Final_BFS = zeros(1,size(A,2));
Final_BFS(BV) =A(:,end);
Final_BFS(end)=sum(Final_BFS.*cost);
OptimalBFS=array2table(Final_BFS);
OptimalBFS.Properties.VariableNames(1:size(OptimalBFS,2))=
coltxt;
disp(OptimalBFS);
```

OUTPUT:

```
Enter the cost matrix :
[3,8,0,0,0,0]
Enter the matrix of basic and nonbasic variables :
[1 1;1 0;0 -1]
Enter the solution matrix :
[200;80;-60]
Basic Variables (BV) =     {'s1'}    {'s2'}    {'s3'}

    x1    x2    s1    s2    s3    sol
    __    __    __    __    __    ___

    -3    -8    0     0     0       0
     1     1    1     0     0     200
     1     0    0     1     0      80
     0    -1    0     0     1     -60


The current solution is not feasible
Leaving row = 3
Entering variable = 2
Basic Variables (BV) =     {'s1'}    {'s2'}    {'x2'}

    x1    x2    s1    s2    s3    sol
    __    __    __    __    __    ___

    -3    0     0     0     -8    480
     1    0     1     0      1    140
     1    0     0     1      0     80
     0    1     0     0     -1     60


The current solution is feasible and optimal
    x1    x2    s1     s2    s3    sol
    __    __    ___    __    __    ___

    0     60    140    80    0     480
```