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SNACKS PRODUCTION RESOURCE ALLOCATION- MATLAB

```
format short
clear all
clc
```

INPUT OBJECTIVE FUNCTIONS & CONSTRAINTS

```
Variables = {'x_1', 'x_2', 'x_3', 's_1','s_2','s_3','s_4', 's_5','s_6','s_7','s_8','s_9','s_10','s_11','s_12','s_13','s_14','s_15','s_16','Sol'};
Cost = [5 7 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
Info = [150 200 250; 50 5 7; 0 50 0; 5 7 8;
        15 25 20; 5 0 0; 12 8 15; 200 300 250;
        0 0 5; 5 10 5; 4 6 8; 60 90 75;
        45 75 60; -1 0 0; 0 -1 0; 0 0 -1];
b = [350000; 250000; 60000; 10000; 100000; 50000; 30000; 500000; 2000; 10000; 30000; 108000; 216000; -800; -350; -250];
s = eye(size(Info, 1)); %identity matrix
A = [Info s b] %combine into single matrix
```

STARTING BFS

```
BV= [] ;
for j=1:size (s,2)
    for i=1:size(A, 2)
        if A(:,i)==s (i,j)
            BV = [BV i];
        end
    end
end
```

CALCULATE VALUE OF ROW Zj-Cj

```
B = A(:, BV);
A = inv(B)*A;
ZjCj = Cost(BV)*A-Cost;

%%% Print Table
ZCj = [ZjCj; A];
SimplexTable = array2table(ZCj);
SimplexTable.Properties.VariableNames(1:size(ZCj,2)) = Variables
```

START SIMPLEX METHOD

```
RUN = true;
while RUN

    ZC = ZjCj(:,1:end-1);

    if any (ZC<0)
        fprintf ('The Current BFS is NOT Optimal \n');

        %%% FINDING THE ENTERING VARIABLE
        [Entval, pvt_col] = min (ZC);
        fprintf('Entering Column = %d \n', pvt_col);

        %%% FINDING THE LEAVING VARIABLE
        sol = A (:, end);
        Column = A (:, pvt_col);

        r = find(Column >0); %% to find minimum ratio
        ratio = inf.*ones(1,length(sol));
        ratio(r) = sol(r)./Column(r);

        [minR, pvt_row] = min(ratio);
        fprintf('Leaving Row = %d \n', pvt_row);

        %%% UPDATE BV
        BV(pvt_row) =pvt_col;

        %%% UPDATE TABLE FOR NEXT ITERATION
        B = A (:, BV);
        A = inv(B)*A;
        ZjCj= Cost(BV)*A-Cost;

        %%% PRINT TABLE
        ZCj = [ZjCj;A];
        TABLE = array2table(ZCj);
        TABLE.Properties.VariableNames(1:size(ZCj,2)) = Variables

    else
        RUN = false;
        fprintf ('CURRENT BFS IS OPTIMAL \n');

    end

end
```

FINAL OPTIMAL SOLUTION

```
FINAL_BFS = zeros(1, size(A, 2));
FINAL_BFS(BV) = A(:, end); % To store BFS value
FINAL_BFS(end) = sum (FINAL_BFS.*Cost); % To compute z value
```

```
OptimalBFS= array2table(FINAL_BFS);
OptimalBFS.Properties.VariableNames(1:size(OptimalBFS,2)) = Variables
```

A =

Columns 1 through 6

150	200	250	1	0	0
50	5	7	0	1	0
0	50	0	0	0	1
5	7	8	0	0	0
15	25	20	0	0	0
5	0	0	0	0	0
12	8	15	0	0	0
200	300	250	0	0	0
0	0	5	0	0	0
5	10	5	0	0	0
4	6	8	0	0	0
60	90	75	0	0	0
45	75	60	0	0	0
-1	0	0	0	0	0
0	-1	0	0	0	0
0	0	-1	0	0	0

Columns 7 through 12

0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
1	0	0	0	0	0
0	1	0	0	0	0
0	0	1	0	0	0
0	0	0	1	0	0
0	0	0	0	1	0
0	0	0	0	0	1
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

Columns 13 through 18

0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
1	0	0	0	0	0
0	1	0	0	0	0
0	0	1	0	0	0
0	0	0	1	0	0
0	0	0	0	1	0
0	0	0	0	0	1
0	0	0	0	0	0

Columns 19 through 20

0	350000
0	250000
0	60000
0	10000
0	100000
0	50000
0	30000
0	500000
0	2000
0	10000
0	30000
0	108000
0	216000
0	-800
0	-350
1	-250

SimplexTable =

17×20 table

x_1	x_2	x_3	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_10	s_11	s_12	s_13	s_14	s_15	s_16	Sol
-5	-7	-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	200	250	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.5e+05
50	5	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5e+05
0	50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	60000
5	7	8	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10000
15	25	20	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1e+05
5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	50000
12	8	15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	30000
200	300	250	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	5e+05
0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2000
5	10	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	10000
4	6	8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	30000
60	90	75	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1.08e+05
45	75	60	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2.16e+05
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	-800
0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-350
0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-250

The Current BFS is NOT Optimal

Entering Column = 2

Leaving Row = 10

TABLE =

17x20 table

x_1	x_2	x_3	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_10	s_11	s_12	s_13	s_14	s_15	s_16	Sol
-1.5	0	-2.5	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	7000
50	0	150	1	0	0	0	0	0	0	0	0	-20	0	0	0	0	0	0	1.5e+05
47.5	-6.245e-16	4.5	0	1	0	0	0	0	0	0	0	-0.5	0	-6.9389e-18	0	0	0	0	2.45e+05
-25	0	-25	0	0	1	0	0	0	0	0	0	-5	0	0	0	0	0	0	10000
1.5	-8.8818e-16	4.5	0	0	0	1	0	0	0	0	0	-0.7	0	0	0	0	0	0	3000
2.5	0	7.5	0	0	0	0	1	0	0	0	0	-2.5	0	0	0	0	0	0	75000
5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	50000
8	0	11	0	0	0	0	0	0	1	0	0	-0.8	0	0	0	0	0	0	22000
50	-3.9968e-14	100	0	0	0	0	0	0	0	1	0	-30	0	-4.4409e-16	0	0	0	0	2e+05
0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2000
0.5	1	0.5	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	1000
1	0	5	0	0	0	0	0	0	0	0	0	-0.6	1	0	0	0	0	0	24000
15	0	30	0	0	0	0	0	0	0	0	0	-9	0	1	0	0	0	0	18000
7.5	-1.4211e-14	22.5	0	0	0	0	0	0	0	0	0	-7.5	0	-1.1102e-16	1	0	0	0	1.41e+05
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	-800
0.5	0	0.5	0	0	0	0	0	0	0	0	0	0.1	0	1.7347e-18	0	0	1	0	650
0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-250

The Current BFS is NOT Optimal

Entering Column = 3

Leaving Row = 9

TABLE =

17x20 table

x_1	x_2	x_3	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_10	s_11	s_12	s_13	s_14	s_15	s_16	Sol
-1.5	0	0	0	0	0	0	0	0	0	0	0.5	0.7	0	1.7347e-17	0	0	0	0	8000
50	0	0	1	0	0	0	0	0	0	0	-30	-20	0	0	0	0	0	0	90000
47.5	0	3.6776e-16	0	1	0	0	0	0	0	0	-0.9	-0.5	0	-3.4694e-17	0	0	0	0	2.242e+05
-25	0	3.3307e-15	0	0	1	0	0	0	0	0	5	-5	0	1.1102e-16	0	0	0	0	20000
1.5	0	-4.4409e-16	0	0	0	1	0	0	0	0	-0.9	-0.7	0	0	0	0	0	0	1200
2.5	0	0	0	0	0	0	1	0	0	0	-1.5	-2.5	0	0	0	0	0	0	72000
5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	50000
8	0	1.1102e-16	0	0	0	0	0	0	1	0	-2.2	-0.8	0	-5.5511e-17	0	0	0	0	17600
50	0	-7.5495e-15	0	0	0	0	0	0	0	1	-20	-30	0	-8.8818e-16	0	0	0	0	1.6e+05
1.0408e-16	0	1	0	0	0	0	0	0	0	0	0.2	-6.245e-17	0	6.9389e-18	0	0	0	0	400
0.5	1	-4.8572e-17	0	0	0	0	0	0	0	0	-0.1	0.1	0	-3.4694e-18	0	0	0	0	800
1	0	5.5511e-17	0	0	0	0	0	0	0	0	-1	-0.6	1	-2.7756e-17	0	0	0	0	22000
15	0	0	0	0	0	0	0	0	0	0	-6	-9	0	1	0	0	0	0	6000
7.5	0	0	0	0	0	0	0	0	0	0	-4.5	-7.5	0	0	1	0	0	0	1.32e+05
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	-800
0.5	0	0	0	0	0	0	0	0	0	0	-0.1	0.1	0	1.7347e-18	0	0	1	0	450
0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	1	150

The Current BFS is NOT Optimal

Entering Column = 1

Leaving Row = 12

TABLE =

17x20 table

x_1	x_2	x_3	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_10	s_11	s_12	s_13	s_14	s_15	s_16	Sol
0	0	0	0	0	0	0	0	0	0	0	-0.1	-0.2	0	0.1	0	0	0	0	8600
0	0	0	1	0	0	0	0	0	0	0	-10	10	0	-3.3333	0	0	0	0	70000
0	0	0	0	1	0	0	0	0	0	0	18.1	28	0	-3.1667	0	0	0	0	2.242e+05
0	0	0	0	0	1	0	0	0	0	0	-5	-20	0	1.6667	0	0	0	0	30000
0	0	0	0	0	0	1	0	0	0	0	-0.3	0.2	0	-0.1	0	0	0	0	600
0	0	0	0	0	0	0	1	0	0	0	-0.5	-1	0	-0.16667	0	0	0	0	71000
0	0	0	0	0	0	0	0	1	0	0	2	3	0	-0.33333	0	0	0	0	48000
8.8818e-16	0	0	0	0	0	0	0	0	1	0	1	4	0	-0.53333	0	0	0	0	14400
0	0	0	0	0	0	0	0	0	0	1	-3.5527e-15	-3.5527e-15	0	-3.3333	0	0	0	0	1.4e+05
0	0	1	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	400
5.5511e-17	1	0	0	0	0	0	0	0	0	0	0.1	0.4	0	-0.033333	0	0	0	0	600
0	0	0	0	0	0	0	0	0	0	0	-0.6	0	1	-0.066667	0	0	0	0	21600
1	0	0	0	0	0	0	0	0	0	0	-0.4	-0.6	0	0.066667	0	0	0	0	400
0	0	0	0	0	0	0	0	0	0	0	-1.5	-3	0	-0.5	1	0	0	0	1.29e+05
0	0	0	0	0	0	0	0	0	0	0	-0.4	-0.6	0	0.066667	0	1	0	0	-400
0	0	0	0	0	0	0	0	0	0	0	0.1	0.4	0	-0.033333	0	0	1	0	250
0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	1	150

The Current BFS is NOT Optimal

Entering Column = 13

Leaving Row = 15

TABLE =

17x20 table

x_1	x_2	x_3	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_10	s_11	s_12	s_13	s_14	s_15	s_16	Sol
0	0	0	0	0	0	0	0	0	0	0	-0.05	3.8858e-16	0	0.083333	0	0	0.5	0	8725
0	0	0	1	0	0	0	0	0	0	0	-12.5	0	0	-2.5	0	0	-25	0	63750
0	0	0	0	1	0	0	0	0	0	0	11.1	3.5527e-15	0	-0.83333	0	0	-70	0	2.067e+05
0	0	0	0	0	1	0	0	0	0	0	-8.8818e-16	0	0	0	0	0	50	0	42500
0	0	0	0	0	0	1	0	0	0	0	-0.35	0	0	-0.083333	0	0	-0.5	0	475
0	0	0	0	0	0	0	1	0	0	0	-0.25	-1.1102e-16	0	-0.25	0	0	2.5	0	71625
0	0	0	0	0	0	0	0	1	0	0	1.25	4.4409e-16	0	-0.083333	0	0	-7.5	0	46125
0	0	0	0	0	0	0	0	0	1	0	1.1102e-16	4.4409e-16	0	-0.2	0	0	-10	0	11900
0	0	0	0	0	0	0	0	0	0	1	-2.6645e-15	-3.9443e-31	0	-3.3333	0	0	8.8818e-15	0	1.4e+05
0	0	1	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	400
0	1	0	0	0	0	0	0	0	0	0	1.3878e-17	5.5511e-17	0	0	0	0	-1	0	350
0	0	0	0	0	0	0	0	0	0	0	-0.6	0	1	-0.066667	0	0	0	0	21600
1	0	0	0	0	0	0	0	0	0	0	-0.25	0	0	0.016667	0	0	1.5	0	775
0	0	0	0	0	0	0	0	0	0	0	-0.75	0	0	-0.75	1	0	7.5	0	1.3088e+05
0	0	0	0	0	0	0	0	0	0	0	-0.25	0	0	0.016667	0	1	1.5	0	-25
0	0	0	0	0	0	0	0	0	0	0	0.25	1	0	-0.083333	0	0	2.5	0	625
0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	1	150

The Current BFS is NOT Optimal

Entering Column = 12

Leaving Row = 16

TABLE =

17×20 table

x_1	x_2	x_3	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_10	s_11	s_12	s_13	s_14	s_15	s_16	Sol
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.083333	0	0	0.5	0.25	8762.5
0	0	0	1	0	0	0	0	0	0	0	0	0	0	-2.5	0	0	-25	62.5	73125
0	0	0	0	1	0	0	0	0	0	0	0	0	0	-0.833333	0	0	-70	-55.5	1.9838e+05
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	50	4.4409e-15	42500
0	0	0	0	0	0	1	0	0	0	0	5.5511e-17	0	0	-0.083333	0	0	-0.5	1.75	737.5
0	0	0	0	0	0	0	1	0	0	0	0	0	0	-0.25	0	0	2.5	1.25	71812
0	0	0	0	0	0	0	0	1	0	0	0	0	0	-0.083333	0	0	-7.5	-6.25	45188
0	0	0	0	0	0	0	0	0	1	0	0	0	0	-0.2	0	0	-10	0	11900
0	0	0	0	0	0	0	0	0	0	1	0	0	0	-3.3333	0	0	8.8818e-15	1.3323e-14	1.4e+05
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	250
0	1	0	0	0	0	0	0	0	0	0	0	0	0	4.6259e-18	0	0	-1	0	350
0	0	0	0	0	0	0	0	0	0	0	0	0	1	-0.066667	0	0	0	3	22050
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.016667	0	0	1.5	1.25	962.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	-0.75	1	0	7.5	3.75	1.3144e+05
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.016667	0	1	1.5	1.25	162.5
0	0	0	0	0	0	0	0	0	0	0	0	1	0	-0.083333	0	0	2.5	-1.25	437.5
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	750

CURRENT BFS IS OPTIMAL

OptimalBFS =

1×20 table

x_1	x_2	x_3	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_10	s_11	s_12	s_13	s_14	s_15	s_16	Sol
962.5	350	250	73125	1.9838e+05	42500	737.5	71812	45188	11900	1.4e+05	750	437.5	22050	0	1.3144e+05	162.5	0	0	8762.5