



Hindustan

Institute of Technology & Science.

Department: Information Technology

OPTIMIZATION TECHNIQUES

ASSIGNMENT-2

Submitted To:

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Assignment problem using Hungarian Method

Q.1 Find the optimal assignment using Hungarian Method

Ans.1

This is the original cost matrix:

1	4	6	3
9	7	10	9
4	5	11	7
8	7	8	5

Subtract row minima

We subtract the row minimum from each row:

0	3	5	2	(-1)
2	0	3	2	(-7)
0	1	7	3	(-4)
3	2	3	0	(-5)

Subtract column minima

We subtract the column minimum from each column:

0	3	2	2
2	0	0	2
0	1	4	3
3	2	0	0
		(-3)	

Cover all zeros with a minimum number of lines

There are 3 lines required to cover all zeros:

0	3	2	2	
2	0	0	2	x
0	1	4	3	
3	2	0	0	x
x				

Create additional zeros

The number of lines is smaller than 4. The smallest uncovered number is 1. We subtract this number from all uncovered elements and add it to all elements that are covered twice:

0	2	1	1
3	0	0	2

0	0	3	2
4	2	0	0

Cover all zeros with a minimum number of lines

There are 4 lines required to cover all zeros:

0	2	1	1	x
3	0	0	2	x
0	0	3	2	x
4	2	0	0	x

The optimal assignment

Because there are 4 lines required, the zeros cover an optimal assignment:

0	2	1	1
3	0	0	2
0	0	3	2
4	2	0	0

This corresponds to the following optimal assignment in the original cost matrix:

1	4	6	3
9	7	10	9
4	5	11	7
8	7	8	5

The optimal value equals 21

Q.2 Solve the assignment Problem

Ans.2

10	5	13	15
3	9	18	3
10	7	3	2
5	11	9	7

Subtract row minima

We subtract the row minimum from each row:

5	0	8	10	(-5)
0	6	15	0	(-3)
8	5	1	0	(-2)
0	6	4	2	(-5)

Subtract column minima

We subtract the column minimum from each column:

5	0	7	10
0	6	14	0
8	5	0	0
0	6	3	2
		(-1)	

Cover all zeros with a minimum number of lines

There are 4 lines required to cover all zeros:

5	0	7	10	x
0	6	14	0	x
8	5	0	0	x
0	6	3	2	x

The optimal assignment

Because there are 4 lines required, the zeros cover an optimal assignment:

5	0	7	10
0	6	14	0
8	5	0	0
0	6	3	2

This corresponds to the following optimal assignment in the original cost matrix:

10	5	13	15
3	9	18	3
10	7	3	2
5	11	9	7

The optimal value equals 16.

Q.3 Solve the assignment Problem

Ans.3

This is the original cost matrix:

18	26	17	11
13	28	14	26
38	19	18	15
19	26	24	10

Subtract row minima

We subtract the row minimum from each row:

7	15	6	0	(-11)
0	15	1	13	(-13)
23	4	3	0	(-15)
9	16	14	0	(-10)

Subtract column minima

We subtract the column minimum from each column:

7	11	5	0
0	11	0	13
23	0	2	0
9	12	13	0
	(-4)	(-1)	

Cover all zeros with a minimum number of lines

There are 3 lines required to cover all zeros:

7	11	5	0	
0	11	0	13	x
23	0	2	0	x
9	12	13	0	
				x

Create additional zeros

The number of lines is smaller than 4. The smallest uncovered number is 5. We subtract this number from all uncovered elements and add it to all elements that are covered twice:

2	6	0	0
0	11	0	18
23	0	2	5
4	7	8	0

Cover all zeros with a minimum number of lines

There are 4 lines required to cover all zeros:

2	6	0	0	x
0	11	0	18	x
23	0	2	5	x
4	7	8	0	x

The optimal assignment

Because there are 4 lines required, the zeros cover an optimal assignment:

2	6	0	0
0	11	0	18
23	0	2	5
4	7	8	0

This corresponds to the following optimal assignment in the original cost matrix:

18	26	17	11
13	28	14	26
38	19	18	15
19	26	24	10

The optimal value equals 59.

.....Thanks You sir.....

.....End.....