

## Maximisation Case in Assignment Problem

In some cases, the pay-off elements of the assignment problem may represent revenue or profit instead of costs so that the objective will be to maximise total revenue or profit. An assignment problem in which the objective function is to maximise total pay-off can also be solved by the Hungarian method. Such type of problems may be solved by first converting the maximisation problem into a minimisation problem with the help of a transformation. The transformation involves subtracting all the elements from the highest element in the original pay-off matrix. The problem then reduces to a minimisation problem. For this transformed assignment problem, the usual assignment algorithm can be applied to obtain the optimal solution.

The total pay-off or profit of the optimal assignments can be found by adding the original pay-offs of those cells to which the assignments have been made.

'unbalanced assignment problem' and 'Restriction on Assignments' may also be in maximisation problems.

See the following illustration for clarification.

### Illustration 10.

Alpha corporation has four plants each of which can manufacture any one of four products. Production costs differ from one plant to another as do sales revenue. Given the revenue and cost data below, obtain which product each plant should produce to maximise profit.

#### Sales Revenue (Rs. 000)

Plant	Products			
	1	2	3	4
A	50	68	49	62
B	60	70	51	74
C	55	67	53	70
D	58	65	54	69

#### Production Cost (Rs. 000)

Plant	Products			
	1	2	3	4
A	49	60	45	61
B	55	63	45	69
C	52	62	49	68
D	55	64	48	66

*Solution:*  
Deducting cost matrix from revenue matrix, we get the following table.

Plants	Products			
	1	2	3	4
A	1	8	3	4
B	5	7	4	1
C	3	5	6	5
D	3	1	4	2

Now subtract each element from Maximum element 8.

Plants	Products			
	1	2	3	4
A	7	0	5	4
B	3	1	4	7
C	5	3	2	3
D	5	7	4	6

Row Reduction

Plants	Products			
	1	2	3	4
A	7	0	3	4
B	2	0	4	7
C	2	0	1	2
D	3	5	1	3

Column Reduction and Making Assignment

Plants	Products			
	1	2	3	4
A	5	0	4	5
B	∞	∞	1	0
C	0	∞	1	1
D	1	5	0	1

Now Optimal solution is arrived and we can assign the value as A—2, B—4, C—1, D—3  
Total Maximum Profit = 8 + 5 + 3 + 6 = Rs. 22 (000)

**Illustration 11.**

Solve the following assignment problem :

Jobs					
	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	20	38	41	36	36
5	29	33	40	35	39

What is the maximum profit?