8. Solve the following minimal assignment problem.

Man → / Job ↓	1	2	3	4
I	12	30	21	15
II	18	33	9	31
III	44	25	24	21
IV	25	30	28	14

Solution

Step I:

Let us find the smallest element in each row and subtract it from all the elements of the corresponding row such that each row contains at least one zero

Man → / Job ↓	1	2	3	4
I	0	18	9	3
II	9	24	0	22
III	23	4	3	0
IV	9	16	14	0

from the given effectiveness matrix.

For Row 1,

minimum or smallest element = 12.

∴ Subtracting 12 from each element of first row,

i.e. $12-12=0$, $30-12=18$, $21-12=9$, $15-12=3$

Similarly for Row 2, 3 and 4,

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Step II:

Starting from the first column find the column or columns having no zero elements and subtract the smallest element of each column to all elements of the corresponding column.

Man → / Job ↓	1	2	3	4
I	0	14	9	3
II	9	20	0	22
III	23	0	3	0
IV	9	12	14	0

Step III:

Starting from the first row find the row having only one zero and mark it as □ and cross (×) all other zeros in the corresponding column.

Man → / Job ↓	1	2	3	4
I	□ 0	14	9	3
II	9	20	□ 0	22
III	23	× 0	3	×
IV	9	12	14	□ 0

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Step IV:
Starting from the first column. Find the column having only one unmarked zero and mark it □ and cross all

Man → / Job ↓	1	2	3	4
I	[0]	14	9	3
II	9	20	[0]	22
III	23	[0]	3	~~0~~
IV	9	12	14	[0]

Step V:
Since each row and each column have a marked zero therefore the solution is optimal and the optimal solution is

Job I should be assigned to 1st Man
Job II " " " 3rd Man
Job III " " " 2nd Man
Job IV " " " 4th Man

Min. Cost = 12 + 9 + 25 + 14
= 21 + 39
= Rs. 60.