1. ASSIGNMENT

The Assignment problem is a special type of Linear Programming problem. The Assignment problem is on ONE to ONE Basis i.e., two jobs cannot be assigned to the same person and 2 persons cannot be assigned the same job. The objective of the assignment problem is to minimise the time or cost or maximise the profit, output, no. of runs.

Under Assignment problem, 'n' jobs have to be assigned to 'm' persons and hence no. of persons must be equal to no. of jobs, it is known as Balanced Matrix. If the no. of jobs ≠ no. of persons, it is known as UnBalanced Matrix.

Procedure for Solving Assignment problem:

Step.1 : Verify the objective of the problem i.e., whether minimisation or maximisation. If it is minimisation proceed to Step.2.

Step.2 : Verify the nature of the data i.e., the no. of rows equal to no. of columns. i.e., Balanced matrix. If it is balanced matrix, proceed to step.3.

Step.3 : Perform Row operation - Subtract the smallest no. in each row from all the elements of such row.

Step.4 : Perform Column Operation. In the resultant matrix from Step.3 Subtract the smallest element in each column from all the elements of such column.

* Step.5 : Draw MINIMUM no. of Horizontal AND Vertical lines to cover all zeros in the matrix. If no. of lines drawn is equal to order of the matrix, Optimal assignment is possible and perform Step.7.

If the no. of lines drawn ≠ Order of the matrix, then perform Step.6

Step.6 : In case no. of lines drawn not equal to (less than) order of the matrix, we have to increase the no. of zeros by performing the following -

a) Select the smallest number uncovered by the lines (Least Open Element (LOE))

b) Rewrite the matrix with the following adjustments.

→ for open elements → Previous element − LOE

→ for Covered elements → Remain unchanged.
(Covered by Single Line)

→ Junction elements → Previous element + LOE.
(Covered by more than one (two) lines)

Repeat Step.5 (i.e. drawing lines) until no. of lines = Order of the matrix.

Step.7 : Optimal Assignment is performed in the following manner:

1. Identify a row with a Single zero.
2. Select the zero as assignment by drawing a box around it.
3. Cancel all the zeros in that column since the same job cannot be assigned to any other person.
4. Continue this procedure until all the rows are assigned.
5. In case of multiple zeros, arbitrary assignment can be made.

Treatment in special cases :

1. Maximisation : In case the objective of the problem is to maximise we have to convert it into minimisation by forming an opportunity cost matrix. It can be done by the following procedure.

* Identify the highest element in the given maximisation matrix.
* Subtract each element in the matrix from the highest element.

Note : Opportunity cost matrix should not have any negative elements

2. UnBalanced Matrix : In case of unbalanced matrix we have to convert it into Balanced matrix by inserting DUMMY ROW(S) Or COLUMN(S) with Cost coefficients being zero.

3. Prohibited Assignment or Restrictive Assignment :

Where a particular job cannot be assigned to a particular individual, it is known as Prohibited assignment. Such cost cell are given a big number represented by 'M' which means infinite cost. The reason behind is infinity cannot be zero and hence no allocation can be done.

4. Facilitative Condition : Where a particular job is to be assigned to a particular individual it is known as Facilitative Condition.

Delete the row and the column in order to reduce the order of the matrix and continue the procedure.