

Travelling Salesman problem:

- There are n number of cities, a Salesman must visit
- The distance / time / cost between every point of cities is given.
- The Salesman starts from his home city, he must visit every city exactly once and returns to his home city.
- The objective is to find the shortest distance / time / cost.

Solution Procedure:

- Travelling Salesman Problem can be first solved as Assignment Problem by Hungarian method to find optimum solution.
- Next check the Travelling Salesman problem Condition.
- If the condition is satisfied, then the Assignment problem solution will be the optimum solⁿ even for Travelling Salesman problem.

If not, go to phase 2.

- (i) The solution can be obtained by method of inspection. or
- (ii) Form a single circuit to solve the problem or
- (iii) The iterative procedure Branch / Bound method.

Ex 1. Find the least cost route from the following Travelling Salesman problem.

Origin

	Destination			
	A	B	C	D
A	0	25	75	45
B	35	0	150	25
C	35	40	0	15
D	65	75	130	0

→ Step 1

	A	B	C	D	Row minimum
A	∞	25	75	45	25
B	35	∞	150	25	25
C	35	40	∞	15	15
D	65	75	130	∞	65

Row reduction

	A	B	C	D
A	∞	0	50	20
B	10	∞	125	0
C	20	25	∞	0
D	0	10	65	∞

Column min

Column reduction

	A	B	C	D
A	∞	0	30	20
B	10	∞	75	0
C	20	25	∞	0
D	0	10	15	∞

Row Scanning & Column Scanning

	A	B	C	D
A	∞	10	0	20
B	10	∞	75	0
C	20	25	∞	0
D	0	10	15	∞

no of squares \neq no of rows

	A	B	C	D
A	∞	0	0	30
B	10	∞	65	0
C	20	15	∞	0
D	0	0	5	∞

no of squares \neq no of rows

	A	B	C	D
A	∞	0	0	20
B	10	∞	55	0
C	10	5	∞	0
D	0	0	5	∞

Optimal Solⁿ no of squares = no of rows

A \rightarrow C, C \rightarrow D, D \rightarrow B, B \rightarrow A

It satisfies the Travelling Salesman problem condition.

A \rightarrow C \rightarrow D \rightarrow B \rightarrow A

$$\text{Total Cost} = 75 + 35 + 15 + 75 = 200$$