

26/2/18

# Travelling Salesman Problem

A salesman is assigned to visit  $n$  cities. He is given the cost of travel between every pair of cities and instructed to visit each city exactly once in a trip and return to the starting city. The problem is to find the route with minimum cost.

## Remarks:

- 1) This problem corresponds to an assignment problem where the cost  $c_{ii} = \infty$ .
- 2) For  $n$  cities, there are  $(n-1)!$  possible solutions.

Q.

	A	B	C	D	E
A	-	14	10	24	41
B	6	-	10	12	10
C	7	13	-	8	15
D	11	14	30	-	17
E	6	8	12	16	-

→

-	4	0	14	31
0	-	4	6	4
0	6	-	1	8
0	3	19	-	6
0	2	6	10	-

↓

	A	B	C	D	E
A	-	2	0	13	27
B	×	-	4	5	0
C	×	4	-	0	4
D	0	1	19	-	2
E	×	0	6	9	-

←

-	2	0	13	27
0	-	4	5	0
0	4	-	0	4
0	1	19	-	2
0	0	6	9	-

(For ordinary assignment problem, this would have been optimal)

$A \rightarrow C \rightarrow D \rightarrow A$  (not optimal)  
(B & E not covered)

	A	B	C	D	E
A	-	2	0	13	27
B	0	-	4	5	0
C	0	4	-	0	4
D	×	0	19	-	2
E	0	×	6	9	-

Choose min. value in each row & col. Here 1. So, mark 1. Cancel assignments in the row & col. of 1. Then, mark the next 0. It will form a cycle.

∴ Path:  $A \rightarrow C \rightarrow D \rightarrow B \rightarrow$

∴ Cost =  $10 + 10 + 8 + 14 + 6$

= 48/-

Q. 2)

	A	B	C	D	E
A	-	7	6	8	4
B	7	-	8	5	6
C	6	8	-	9	7
D	8	5	9	-	8
E	4	6	7	8	-

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

-	3	0	4	X
2	-	1	0	1
0	2	-	3	1
3	0	2	-	3
X	2	1	4	-

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

-	3	X	4	X
2	-	1	0	1
0	2	-	3	1
3	0	2	-	3
X	2	1	4	-

-	3	X	4	X
2	-	1	0	1
X	2	-	3	1
3	0	2	-	3
X	2	X	4	-

$A \rightarrow E \rightarrow C \rightarrow A$  (not open)

$A \rightarrow C \rightarrow E \rightarrow A$  (not open)

-	3	0	4	X
2	-	1	X	1
X	2	-	3	X
3	0	2	-	3
0	2	X	-	-