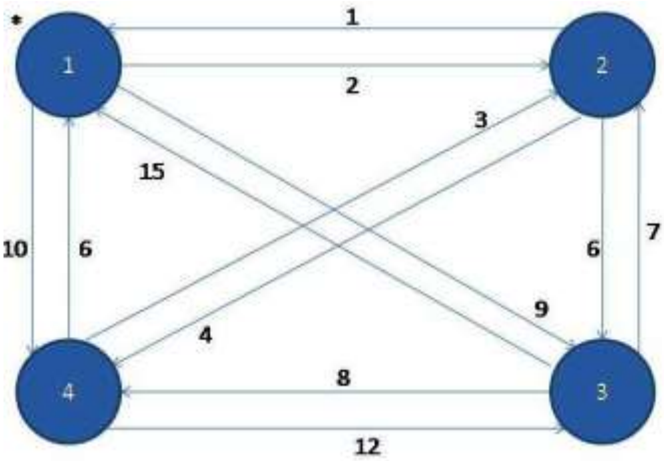
# TRAVELLING SALESMAN PROBLEM

**TSP touring diagram: (Problem)**




This is a tabular representation of Travelling Salesman Problem-Solution through Dynamic Programming approach, which is easily understandable and traceable the optimal solution to get the result. We will make use of Hamiltonian cycle to solve the problem.

**HOME NODE = {1},** **TRAVERSING NODES = {2, 3, 4}**

**POWER SET OF TRAVERSING NODES = {φ, (2), (3), (4), (2, 3), (3, 4), (2, 4), (2, 3, 4)}**

**TSP TABLE: Solution**

| | **2** | **3** | **4** | **1 (HOME)** |
|---|---|---|---|---|
| **φ** | 1 | 15 | 6 | **0** |
| **{2}** | **0** | c32+c21=7+1=8 | c42+c21 =3+1=4 | **0** |
| **{3}** | c23+c31=6+15=21 | **0** | c43+c31=12+15=27 | **0** |
| **{4}** | c24+c41 =4+6=10 | c34+c41=8+6=14 | **0** | **0** |
| **{2,3}** | **0** | **0** | c42+g(2,{3})=3+21=24<br>c43+g(3,{2})=12+8=20<br>**MIN = 20** | **0** |
| **{3,4}** | c23+g(3,{4})=6+14=20<br>c24+g(4,{3})=4+27=31<br>**MIN = 20** | **0** | **0** | **0** |
| **{4,2}** | **0** | c32+g(2,{4})=7+10=17<br>c34+g(4,{2})=8+4=12<br>**MIN = 12** | **0** | **0** |
| **{2,3,4}** | **0** | **0** | **0** | c12+g(2,{3,4})=2+20=22<br>c13+g(3,{2,4})=9+12=21<br>c14+g(4,{2,3})=10+20=30<br>**MIN=21** |

**ANSWER:**
**TRAVERSING PATH: 1->3->4->2->1**
**MINIMUM TRAVERSING COST = 21**

**Time complexity evaluation:**

Power set of nodes takes = $2^n$
Calculation of minimum cost takes = $n^2$
So, total time complexity = $2^n n^2$ which is much less than O(n!) as per Brute-Force method

BY MR. VIJAY KUMAR VISHWAKARMA, ASSISTANT PROFESSOR, AKS UNIVERSITY SATNA