

TSP: BmB.

$$lb = \left\lceil \sum_{i=1}^n \text{minimum weight edges on every vertex} / 2 \right\rceil$$

$\lceil (2 \text{ min edges on vertex a} + 2 \text{ min edges on vertex b} + 2 \text{ min edges on vertex c} + 2 \text{ min edges on vertex d} + 2 \text{ min edges on vertex e}) / 2 \rceil$

$$= \left\lceil \frac{(1+3) + (3+6) + (1+2) + (3+4) + (2+3)}{2} \right\rceil$$

$$= \lceil 28/2 \rceil = 14 \text{ lower bound}$$

Initial State

#0
a
lb = 14

Generate possible paths

#1
a, b
lb 14

#2
a, c

not feasible
Soln
terminated
mode.

#3
a, d
lb 16

#4
a, e
lb 19

You cannot visit c before b
b → c ✓
a → c ✗

$$\begin{aligned} & \frac{(3+1) + (3+6) + (1+2) + (3+4) + (2+3)}{2} \\ &= \lceil 28/2 \rceil = 14 \end{aligned}$$

$$\begin{aligned} & \frac{(1+5) + (3+6) + (1+2) + (5+3) + (2+3)}{2} \\ &= \lceil 31/2 \rceil = \lceil 15.5 \rceil \\ &= 16 \end{aligned}$$

$$\begin{aligned} & \frac{(8+1) + (3+6) + (1+2) + (3+4) + (8+2)}{2} \\ &= \lceil 38/2 \rceil \\ &= 19. \end{aligned}$$

branch mode 1
(lowest lb)

#5
a, b, c
lb 16

#6
a, b, d
lb 16

#7
a, b, e
lb 19

$$\begin{aligned} & \frac{(1+3) + (3+6) + (1+6) + (3+4) + (2+3)}{2} \\ &= \lceil 32/2 \rceil = 16 \end{aligned}$$

$$\begin{aligned} & \frac{(1+3) + (7+3) + (1+2) + (7+3) + (2+3)}{2} \\ &= \lceil 32/2 \rceil = 16 \end{aligned}$$

$$\begin{aligned} & \frac{(1+3) + (9+3) + (1+2) + (3+4) + (9+2)}{2} \\ &= \lceil 37/2 \rceil = \lceil 18.5 \rceil \\ &= 19 \end{aligned}$$

branch at node 5.

branch at node 6

#8

a, b, c, d
1c, a
lb = 24

$$\frac{(1+3) + (3+6) + (1+6) + (4+1) + (4+3)}{2}$$

$$\lceil 32/2 \rceil = 16$$

Since 'ea' is the only edge that completes the lower Hamiltonian circuit, add its value to lb.
 $16 + 8 = 24$

#9

a, b, c, e
1da
lb = 19

$$\frac{(1+3) + (3+6) + (1+6) + (2+1) + (2+3)}{2}$$

$$\lceil 28/2 \rceil = 14$$

Since 'da' is the only edge that completes the "Hamiltonian circuit" add it to lb.
 $14 + 5 = 19$

#10

a, b, d, c
1e, a
lb = 24

$$\frac{(1+3) + (7+3) + (1+2) + (7+3) + (2+3)}{2}$$

$$\lceil 32/2 \rceil = 16$$

Since 'ea' is only edge completing the circuit add its weight to lb.

$$16 + 8 = 24$$

#11

a, b, d, e
1c, a
lb.

$$\frac{(1+3) + (7+3) + (1+2) + (7+3) + (2+3)}{2}$$

$$= 16$$

Since 'ca' is only edge completing H.C but it is already added in lb

So cost is 16.

Optimal tour is node 11.