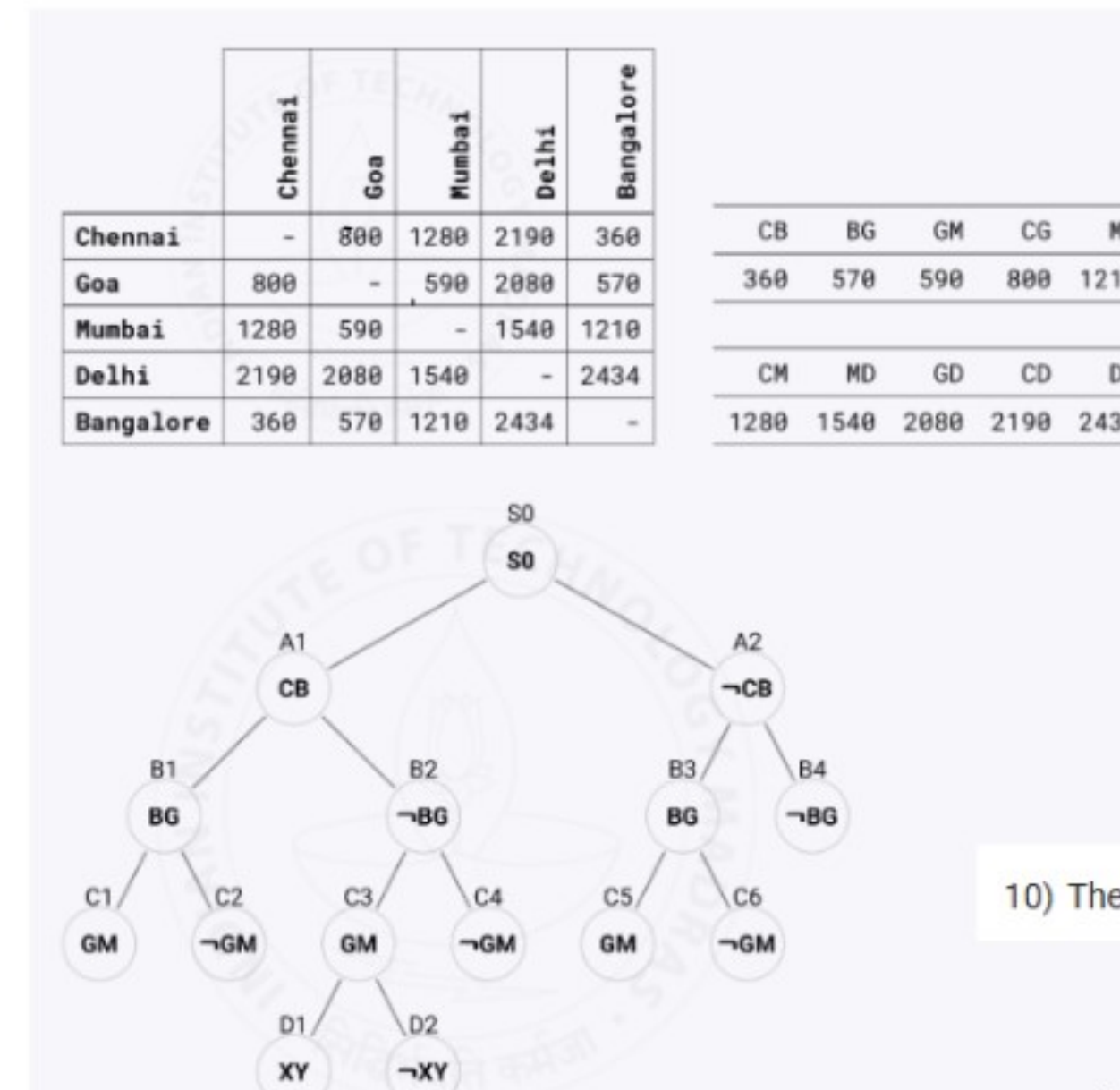


TSP BnB starts with a selection of 2N (directed/one-way) edges that satisfy the following condition (invariant):
 There are N cities.
 Each city contributes exactly 2 outgoing edges.
 There are a total of 2N edges that guarantee a lower bound on the tour cost.
 The 2N edges represent a partial solution (zero or more fragments of a tour). A partial solution represents a set of tours, as demonstrated in TSP BnB Part 1.

PE: BD, BM, CG
 PI: BC, BG, MD
 $h = \{BCMDG\}$
 $\sum = 4740$
 C: 360+1280
 G: 570+590
 M: 1540+590
 D: 1540+2434
 B: 360+570



To create a1 (S0, CB), make a copy of the 2N edges in S0 and update the edges.

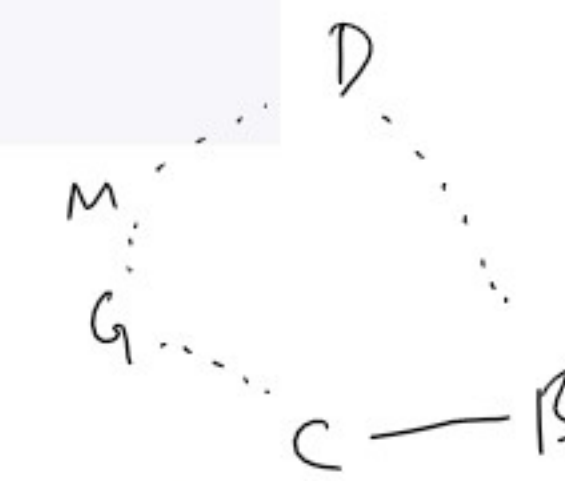
7) The number of permanently included segments in a1 (S0, CB) are _____.

$a_1 = \{ \begin{matrix} CBMDG \\ CBMGD \\ CBDMG \\ BCDMG \\ BCDMG \end{matrix} \}$

$$S_2 = \frac{5 \times 4}{2} = 10 \text{ segments}$$

CB
 CM
 CD
 CG
 BM
 BD
 BG

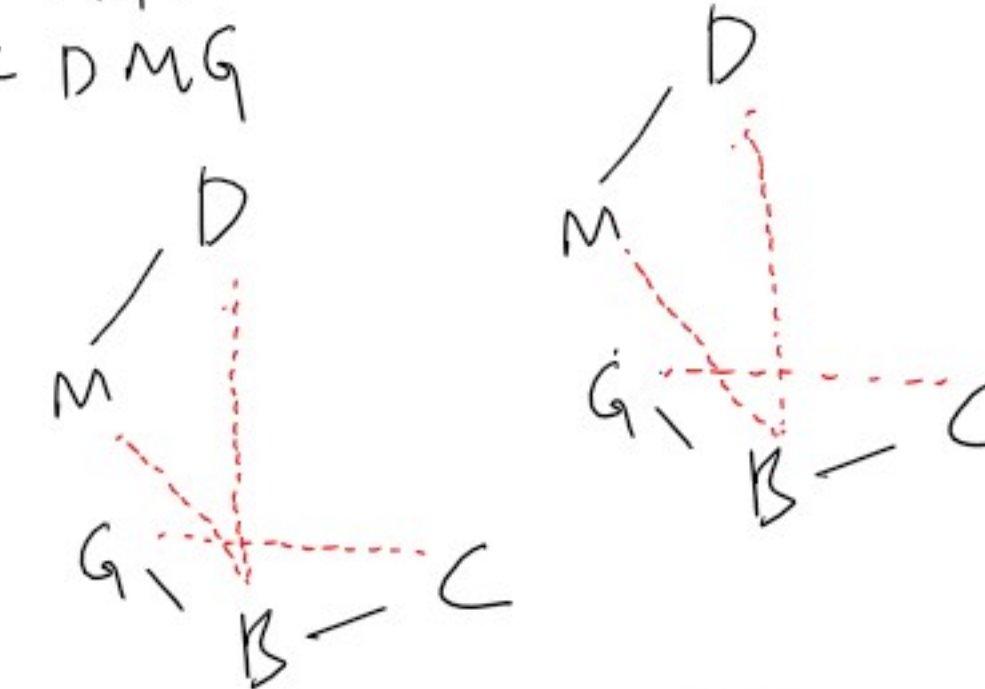
10) The number of default edges in a1 (S0, CB) are 8.



To create b1 (S0, CB, BG), make a copy of the 2N edges in a1 (S0, CB) and update the edges.

14) The PI segments in b1 (S0, CB, BG) are _____.

$a_1 = \{ \begin{matrix} CBMDG \\ CBMGD \\ CBDMG \\ BCDMG \\ BCDMG \end{matrix} \}$
 $h = \{BCMDG\}$



PI	PE	default
<input type="checkbox"/> BD	<input checked="" type="checkbox"/> BD	<input type="checkbox"/> BC
<input type="checkbox"/> BM	<input checked="" type="checkbox"/> BM	<input type="checkbox"/> BG
<input checked="" type="checkbox"/> BG	<input type="checkbox"/> BG	<input type="checkbox"/> CB
<input checked="" type="checkbox"/> CB	<input type="checkbox"/> CB	<input checked="" type="checkbox"/> CM
<input type="checkbox"/> CD	<input type="checkbox"/> CD	<input checked="" type="checkbox"/> DG
<input type="checkbox"/> CG	<input checked="" type="checkbox"/> CG	<input type="checkbox"/> DM
<input type="checkbox"/> CM	<input type="checkbox"/> CM	<input type="checkbox"/> GB
<input checked="" type="checkbox"/> DM	<input type="checkbox"/> DM	<input checked="" type="checkbox"/> GM
<input type="checkbox"/> GD	<input type="checkbox"/> GD	<input type="checkbox"/> MD
<input type="checkbox"/> GM	<input type="checkbox"/> GM	<input checked="" type="checkbox"/> MG

C 1 B 2 (default) M CM
 G 1 B M GM
 D M G DG
 M D G MG

S 22f2001590:

Is CD also a default edge even though its not in the given options?

{ CB, BG } implies { DM, ~CG, ~BD, ~BM }

Therefore,

PI segments = { CB, BG, DM }

PE segments = { ~CG, ~BD, ~BM }

To fulfill the 2N edges invariant, each of the cities { C, G, D, M } need exactly one more outgoing edge which is cheapest allowable edge that we call default edge for the purpose of providing a lower bound estimate.

In this case, each of the cities { C, G, D, M } need exactly one default edge to fulfill the 2N edges invariant.

- Instructor

	Chennai	Goa	Mumbai	Delhi	Bangalore
Chennai	-	800	1280	2190	360
Goa	800	-	590	2080	570
Mumbai	1280	590	-	1540	1210
Delhi	2190	2080	1540	-	2434
Bangalore	360	570	1210	2434	-

$\alpha_1 = (S0, CB)$

$\left\{ \begin{array}{l} CB\ MDG \\ CB\ MQD \\ CB\ DMG \\ BC\ MDG \\ BC\ MQD \\ BC\ DMG \end{array} \right\}$

$(S0, CB, \sim BG)$

$b_2 = \left\{ \begin{array}{l} CB\ MDG \\ CB\ MQD \\ CB\ DMG \\ BC\ MDG \\ BC\ MQD \end{array} \right\}$

19) The PI edges in $b_2 (S0, CB, \sim BG)$

- ☒ BC
- ☐ BG
- ☒ CB
- ☐ CG
- ☐ GB
- ☐ GC

20) The PE edges in $b_2 (S0, CB, \sim BG)$

- ☐ BC
- ☒ BG
- ☐ CB
- ☐ CG
- ☒ GB
- ☐ GC

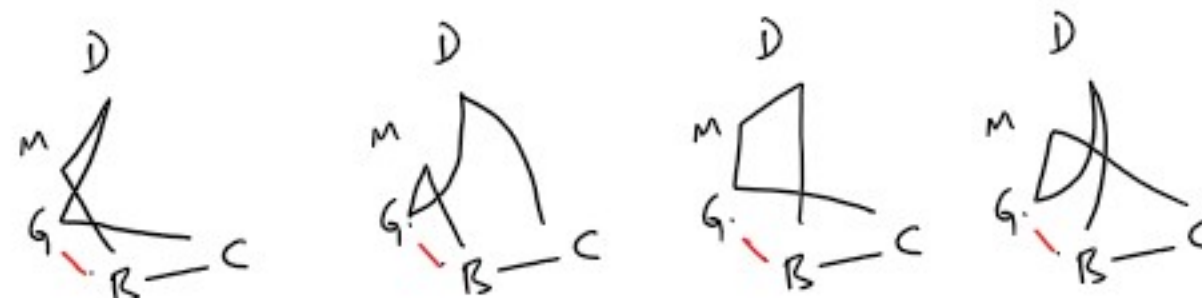
PI: BC, CB

PE: BG, GB

doubt

21) In $b_2 (S0, CB, \sim BG)$, the segment BG was replaced by the default edges.

- ☒ BM
- ☐ CG
- ☐ GC
- ☐ MB



Bangalore row.
Starting 2 default

From B $\rightarrow C_{360}$

Now BG is P.E

Next default is M

So BM is new default

Goa row
Starting 2 default

$G \rightarrow B_{570} \quad M_{590}$

Now GB is PE

Next default is C

So GC is next default

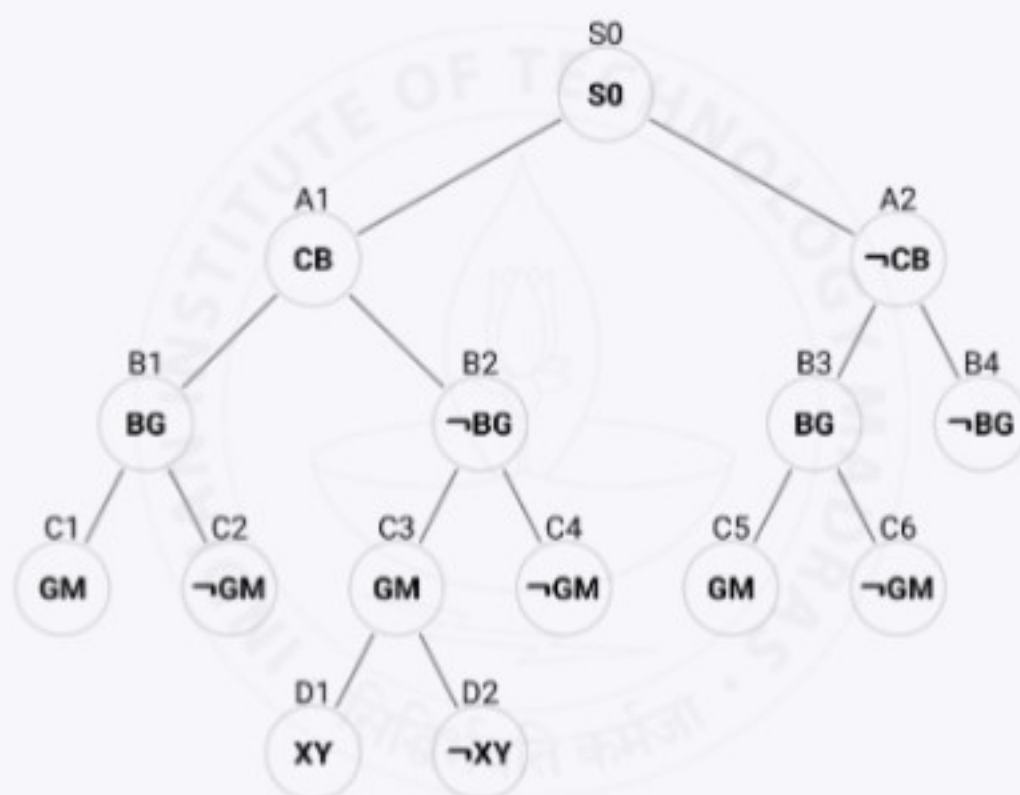
why not CG

\therefore asking for edges.

	Chennai	Goa	Mumbai	Delhi	Bangalore
Chennai	-	800	1280	2190	360
Goa	800	-	590	2080	570
Mumbai	1280	590	-	1540	1210
Delhi	2190	2080	1540	-	2434
Bangalore	360	570	1210	2434	-

CB	BG	GM	CG	MB
360	570	590	800	1210

CM	MD	GD	CD	DB
1280	1540	2080	2190	2434



$(S0, CB, \sim BG)$

$b_2 = \left\{ \begin{array}{l} CBMDG \\ CBMGD \\ CBDMG \\ BCMGD \end{array} \right\}$

$c_4 = \left\{ CBMDG \right\}$

To create c_4 ($S0, CB, \sim BG, \sim GM$), make a copy of the 2N edges in b_2 ($S0, CB, \sim BG$) and update the edges.

23) In c_4 ($S0, CB, \sim BG, \sim GM$), infer as much as possible then list all the PI segments.

- ☐ BD
- ☐ BG
- ☒ BM
- ☒ CB
- ☐ CD
- ☒ CG
- ☐ CM
- ☒ DG
- ☒ DM
- ☐ GM

24) In c_4 ($S0, CB, \sim BG, \sim GM$), infer as much as possible then list all the PE segments.

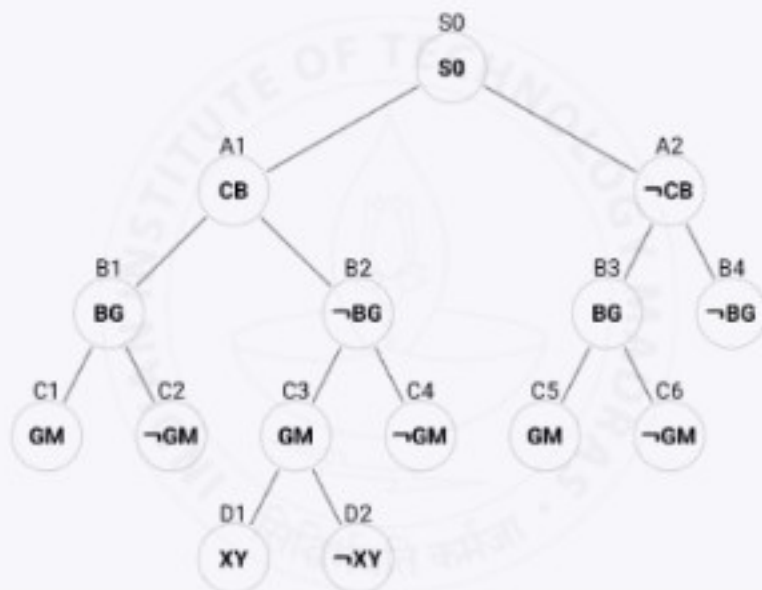
- ☒ BD
- ☒ BG
- ☐ BM
- ☐ CB
- ☒ CD
- ☐ CG
- ☒ CM
- ☐ DG
- ☐ DM
- ☒ GM

$$\frac{W}{2} = 5990$$

	Chennai	Goa	Mumbai	Delhi	Bangalore
Chennai	-	800	1280	2190	360
Goa	800	-	590	2080	570
Mumbai	1280	590	-	1540	1210
Delhi	2190	2080	1540	-	2434
Bangalore	360	570	1210	2434	-

	Chennai	Goa	Mumbai	Delhi	Bangalore
Chennai	-	800	1280	2190	360
Goa	800	-	590	2080	570
Mumbai	1280	590	-	1540	1210
Delhi	2190	2080	1540	-	2434
Bangalore	360	570	1210	2434	-

CB	BG	GM	CG	MB
360	570	590	800	1210
CM	MD	GD	CD	DB
1280	1540	2080	2190	2434



$$XY = CG$$

$$b_2 = \left\{ \begin{array}{l} CBMDG \\ CBMGD \\ CBDMG \\ BCLMGD \end{array} \right\}$$

$$c_3 = \left\{ \begin{array}{l} \cancel{CBMDG} \\ CBMGD \\ CBDMG \\ BCLMGD \end{array} \right\}$$

$$D_2 = \left\{ \begin{array}{l} CBMGD \\ BCLMGD \end{array} \right\}$$

5975

$$D_1 = \left\{ \begin{array}{l} CBDMG \end{array} \right\}$$

5724