

# AE310 Engineering Design Optimization

## Assignment No. 5

### TRAVELING POLITICIAN PROBLEM

Due Date: 10:55 AM on Wednesday 4<sup>th</sup> April 2012

A politician has to conduct an election campaign, for which s/he has to visit 30 major cities in India, starting from a particular city, indicated in the map below.



The dark black line in the map above divides it into four sectors.

The X and Y co-ordinates of all the cities from the origin marked in the map are listed below.

City	x-co-ordinate	y-co-ordinate
Shrinagar	232.6411163	892.550086
Shimla	294.4151439	786.4967604
Chandigarh	286.3153284	773.7317148
Delhi	298.9075975	705.7904636
Dehradun	319.0384046	761.0683705
Lucknow	407.4444562	635.9640927
Jaipur	252.285086	641.9499805
Patna	532.1485645	598.0401657
Kolkata	632.6611642	500.5799265
Ranchi	542.7428643	521.5973592
Raipur	424.7450549	444.8341936
Bhopal	299.8574519	518.868119
Gandhinagar	152.8734539	522.7502295
Bhubaneshwar	565.7135572	419.6956524
Mumbai	155.6917521	369.8188509
Hyderabad	331.5216194	312.9049925
Panaji	180.8223214	244.5569361
Bangalore	301.692398	157.7681353
Chennai	389.4508215	160.1109106
Pondicherry	373.3159532	121.8361141
Thiruvananthapuram	275.9562595	0.517330645
Gangtok	629.7781032	666.2560104
Shillong	736.1658793	617.66573
Dispur	729.9560951	634.6434153
Itanagar	780.8012152	670.8805402
Kohima	801.4501247	624.2008047
Imphal	799.5708871	592.3339564
Aizawl	769.1695943	549.7753294
Agartala	726.2947641	551.7926606

Each student is assigned a specific starting city, as listed in the table below.

Sr.	Roll No.	City Allocated
1	9001001	Shrinagar
2	9001003	Shimla
3	9001008	Chandigarh
4	9001017	Delhi
5	9001019	Dehradun
6	9001020	Lucknow
7	9001022	Jaipur

8	9001023	Patna
9	9001025	Kolkata
10	9401001	Ranchi
11	09D01003	Raipur
12	09D01006	Bhopal
13	09D01011	Gandhinagar
14	09D01014	Bhubaneshwar
15	09D01015	Mumbai
16	114010008	Hyderabad
17	11V011008	Panaji
18	9001004	Bangalore
19	9001005	Chennai
20	9001006	Pondicherry
21	9001007	Thiruvananthapuram
22	9001010	Gangtok
23	9001011	Shillong
24	9001014	Dispur
25	9001018	Itanagar
26	9001024	Kohima
27	9001026	Imphal
28	9001027	Aizawl
29	9103021	Agartala
30	09D01001	Shrinagar
31	09D01002	Shimla
32	09D01005	Chandigarh
33	09D01008	Delhi
34	09D01009	Dehradun
35	09D01010	Lucknow
36	09D01012	Jaipur
37	09D01013	Patna
38	09D01016	Kolkata
39	09D01017	Ranchi
40	09D01018	Raipur
41	09D01019	Bhopal
42	09D01020	Gandhinagar
43	09D01023	Bhubaneshwar
44	113100020	Mumbai
45	9001013	Hyderabad
46	9001012	Panaji
47	9001016	Bangalore

Find out the route to be followed by the politician that minimizes the total trip cost, keeping in mind the following assumptions:

- All the routes are traversed in straight lines, “as the crow flies”.
- The cost of travelling one unit of distance is Rs. 100
- If any route crosses the vertical line in the map, an additional cost of Rs. 2000 is incurred.
- If any route crosses the horizontal line in the map, an additional cost of Rs. 1500 is incurred.
- If the politician visits a city twice, an additional cost of Rs. 1 Crore is incurred.