Travelling Salesman Problem with GA.

finding the shortest path for a salesperson to take, given a starting point, and visit every city exactly once and returns to the starting point.

SNO	City	Mumbai	Kol	Varanasi	Jaipur	Vijayawada	Jaipur
1	Mum	0	1930	1454	1096	991	1152
2	Kol	1930	0	684	1091	1211	1552
3.	Var	1454	684	0	459	1427	564
4	Jaipur	1096	1091	459	0	1046	508
5	Vijayawada	991	1211	1427	1046	0	1619
6	Jaipur	1152	1552	564	508	1619	0.

Random Solutions	Path length = fitness	Prob	Expected Count
3 4 6 5 2	459+508+1619+1211=4097	0.19	0.95
2 4 3 5 6	1091+459+1427+1619 = 4596	0.21	1.06
4 6 5 3 2	508+1619+1427+684=4538	0.21	1.05
2 6 5 3 4	1552+1619+1427+459= 5057	0.23	1.18
6 4 3 2 5	508+459+684+1211 = 3162	0.14	0.73
		21,480	

Avg : 4296.

3 4 | 6 5 2

6 4 | 3 5 2

3 | 4 6 5 | 2

6 | 4 3 5 | 2

Partially mapped Crossover :- Single Point Crossover is not at all going to work.

→ Partial part is copied and then the mapping is used in Crossover.

P1: 3 | 4 6 5 | 2

P2: 6 | 4 3 5 | 2

mapping.

Child 1 : 6 * | 4 3 5 | * 2 => 6 4 3 5 2 | 4 = 4, 3 = 6, 5 = 5

Child 2 : * | 4 6 5 | * => 3 4 6 5 2

3 2.

Here 2 is not participating in mapping.

Order Crossover :- Order intact and is similar to partially mapped.

3 | 4 6 5 | 2 => 2 | 4 6 5 | 3

=> 3 | 4 6 5 | 2

3 | 4 6 5 | 2

6 | 4 3 5 | 2

6 | 4 3 5 | 2

New children

3 | 4 6 5 | 2

Cost 808 + 459 + 1427 + 1211

= 3905

459 + 808 + 1619 + 1211

= 4097

Mutation Swap. mutation

6 3 4 5 2

884 + 459 + 1046 + 1211 = 3620

Partially mapped Crossover :-

Examples :- Parent 1 :- A C | B D E | F G

Parent 2 :- C D | B G A | E F.

Child 1 : E C | B G A | F D.

Child 2 : C G | B D E | A F.

Mapping.

B	D	B
‖	‖	‖
B	G	A

Order Crossover Examples.

P1 : A C | B D E | F G

P2 : C D | B G A | E F

Child1 : C D | B G A | E F

: C G | B D E | A F.