G52AIM CW4 REPORT

QUESTION 1.

The previous algorithms that were implemented are local search algorithms which means they will find a local optimum in the graph and discover the optimum in more depth. Memetic algorithms use a population-based search which means the algorithm will avoid converging to local optima and use exploration of the search space and exploitation of promising areas. Apart from those, memetic algorithms conduct search in parallel over the search space unlike previous algorithms which performed individual searches throughout a certain time.

QUESTION 2.

Memes can change, evolve using rules and time scales other than the traditional genetic ones. That means, the memetic algorithms aim to improve genetic algorithms by embedding local search metaheuristics.

QUESTION 3.

Tournament selection is a method that involves running a number of "tournaments" among randomly chosen individuals (of tour size) selecting the one with best fitness at the end. This process is repeated for selecting each parent to be recombined. If the tournament size would be equal to the population size the algorithm will always return the best fitting parent/parents. If there's a single individual that has the best fitness, then it would be returned for bot parents. If there are multiple individuals that are suitable for the best solution, the algorithm will return two random solutions as the parent. Similarly, the same individual could also be used in this case for both parents.

QUESTION 4.

If the population is replaced with the population_size, the algorithm will only take a certain number of individuals from the population that shows improving/fitting characteristics. For example, if we had 8 parents and 8 children, the algorithm will go over every single value and only select the best ones out of these individuals. In some cases, it could only select the parents as the set of solution. This is "***bad***" for the algorithm due to the loss of children since the other children could carry potentially improving solutions.

QUESTION 5.

Q5A.

1. After mutation
2. Before crossover

Q5B.

I hypothesise that performing a local search after the mutation would statistically perform better that applying a search before the crossover because parents are chosen at the end of a tournament that determines which selection of parents is more suitable for the solution although crossover and mutation does not necessarily bring children that are the most optimal for the solution therefore a local search is necessary to improve upon the children.

Q5C.

A Wilcoxon Signedrank Test has been performed. The test was left-tailed. X was configuration one (after mutation) and y was second configuration (before crossover). Significance level was 0.05 and the method was exact. The value of p is 0.7767, the value of h is 0 and the signedrank value is 236.5. Since p is less than 0.05 that means there is a significant difference in values although that isn't the case. Similarly, if h is 1 that also shows there is a significant difference in the values although this is not the case either. Since the difference between the values is not significant, it is possible to conclude that the hypothesis is I came up with is wrong and null hypothesis is accepted.

Q5C. RAW RESULTS AS REPORTED IN CSV OUTPUT

Trial	Configuration 1	Configuration 2
0	34	30
1	32	28
2	32	33
3	32	32
4	32	27
5	25	36
6	28	25
7	33	22
8	32	31
9	25	25
10	27	29
11	29	25
12	30	27
13	32	26
14	31	27
15	28	31
16	29	34
17	37	28
18	32	31
19	33	32
20	30	32
21	31	33
22	26	29
23	35	25
24	29	33
25	27	30
26	31	29
27	27	24
28	30	34
29	31	33