Question 1:

Test cases : 10000
Hill climbing :
Enter the function : hillclimbing
Heuristic Used - function eval-manhatten
Percentage of solved problems - 0.439
Average success cost - 10.7904328018
Average failure cost - 3.01407177509

Random Restart Hill Climbing :
Test Cases : 100
Enter the function : randomhillclimbing

Percentage of solved problems - 100.0
Average success cost - 1278.41

Simulated Annealing :
Test Cases :

Question 2:

a) Consider a MIN node whose children are terminal nodes. If MIN plays suboptimally, then the value of the node is greater than or equal to the value it would have if MIN played optimally. Hence, the value of the MAX node that is the MIN nodeâs parent can only be increased. This argument can be extended by a simple induction all the way to the root. If the suboptimal play by MIN is predictable, then one can do better than a minimax strategy. For example, if MIN always falls for a certain kind of trap and loses, then setting the trap guarantees a win even if there is actually a devastating response for MIN.

b) The game tree is as follows : The inital root has 2 nodes which in turn have nodes as follows : 5, 5, 10, 4

Question 3 :

a) Any position in tic-tac-toe is either 'X' or 'O' or empty , when the upper bound for a complete game tree is 3^n where n is the size of S.
b) Difference in the number of winning moves of Max and Min
c) the $\alpha - \beta$ pruning algorithm runs faster than minmax algorithm.