COMS 4701 - Homework 2 - Written

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Question 1

1) h(n)= min(h1(n), h2(n))
Admissible heuristics will not be overestimate the cost. However, h1(n) > =min(h1(n), h2(n)) h2(n)>= min(h1(n), h2(n))
So, h(n) which proves h(n) is admissible.
2)h(n)=max(h1(n),h2(n)) h1(n) and h2(n) is admissible. As a result, h(n) is admissible
3)h(n)=w*h1(n)+ (1-w)*h2(n) with 0<=w<=1 $W * h1(n)$¡= $W * h^*(n)$ $(1 - w) * h2(n)$¡= $(1 - w) * h^*(n)$ As a result, $w * h1(n) + (1 - w) * h2(n) <= h^*(n)$ S0, h(n) is admissible

Question 2

The solution may be 9!/2. Since the total configuration should be 9! if it is in the worst case. Since every states is not chosen randomly, we need to divide to get possible valid, not -repeating movements.In other word, the set of all states reachable from a given state is 9!/2.
https://mathworld.wolfram.com/15Puzzle.html http://ai.stanford.edu/ latombe/cs121/2011/slides/B-search-problems.ppt

Question 3

a) $(6^6) = 46656$
b) 6*5=30 successors c)Let the queens be labeled as q1, q2, q3, q4, q5, and q6.
Q1 is not attacking with Q2,Q4,Q5 =3
Q2 is not attacking with Q1,Q3,Q5=2
Q3 is not attacking with Q2,Q4,Q5=3
Q4 is not attacking with Q1,Q2,Q3,=3
Q5 is not attacking with Q1,Q2,Q3,Q4=4
Q6 is not attacking Q2,Q3,Q4=3
The pairs should be 18/2=9 pairs
As a result, the fitness function should be 9.
D) We need to consider mutation method, since mutation needs each element in the string can also be some mutation with a small probability(in the lecture) In this case, this algorithm will choose one queen randomly to move a special position that can count its successor. As a result, mutation will change one queen per time in one column.

Question 4

Advantage
1) Local search is relative saved time if you know the area. Because the area is always given, it will not waste time to do large amounts of searching.
2) Local search uses very little among of space. Because it doesn't need to store a lot of neighbors, it only will take care of the node around.
3) Local search doesn't need to a search tree, since the algorithm is straight forward. Local search algorithms are typically approximation or incomplete algorithms, as the search may stop even if the best solution found.
Disadvantage:
1) It doesn't have a stopping criteria, because local search algorithms are typically approximation or incomplete algorithms, as the search may stop even if the best solution found.
2) It can't prove the best solution, because its algorithm can't search for the best path. It is an incomplete algorithm which it only can search for the local best value.
3) They often have problems with highly constrained, because local search only perform well in pure optimization problems. Since that, local search can't be used widely.