Name:	ID:

1. For each of the following problems find out the size of the neighborhood and the search space. [2×2=4]

   (a) A satisfiability problem with 73 variables and 137 clauses. Neighborhood is single flip.

   (b) A graph vertex-coloring problem for a graph with 73 nodes, 237 edges and 5 colors. Use single flip neighborhood.

   SAT: Search space, 2^{73}, Neihghborhood, 73

   Vertex-Color: Search space, 5^{73}, Neihghborhood, 4×73

2. Two friends of yours are running Simulated Annealing Algorithm to solve N-queen problem. One of them is initializing $T = 2400$, the other person $T = 24000$ which algorithm you suppose to work better and why?   [2] With the same cooling schedule, T=24000 will have more exploration compared to T=2400.

3. Consider the following three algorithms: {Simulated Annealing, Greedy Hill Climbing, Random Walk}. Sort them according to both their intensification/exploitation and diversification/exploration features. Justify your answer.   [2] Exploitation wise: Greedy Hill CLimbing > Simulated Anealing > Random Walk

4. Consider the local search algorithm *LocalSearch()*. Suppose that you are using it to solve the 100-queen problem. This algorithm generates an impractically large number of successors to move from one state to another, and also lacks diversification. Propose some modification(s) to this algorithm to resolve these issues.   [2]

```
LocalSearch()
  s = generate_random_state()
  repeat:
    if is_goal(s)
      return s
    successors = generate_all_successors(s)
    next = pick_best_state(successors)
    if quality(next) is better than quality(s)
      s = next
    else
      break
  return s
```

   • Do not generate all successors, randomly generate single/few and select based on fitness
   • For more diversification, allow worse steps / random restart