**1. Define in your own words the terms constraint satisfaction problem, constraint, back-tracking search, back-jumping, and min-conflicts. [2.5 points]**

A constraint satisfaction problem is a problem that using a factored representation for each state and solved when each variable has a value that satisfies all the constraints on the variable. It contains a finite set of variables, a set of discrete and a finite set of constraints.

CSP is a problem that requires its solution within some limitations or conditions. And those are the constraint.

Back-tracking search is a general algorithm that incrementally builds candidates to the solutions, and abandon a candidate which is the backtrack as soon as it determines that the candidate cannot possibly be completed to a valid solution.

Back-jumping is a technique that reduces search space and then increase efficiency. Because partial assignment of back-tracking is not always necessary to prove Xk+1 lead to a solution. In particular, there is an index that cannot be form to a solution. If we can prove this fact, then, we can consider a different value Xj instead of reconsider the Xk as it would normally do.

Min-conflicts assigned random values to all variables of a CSP. Then it selects randomly a variable whose value conflicts with any constraint of the CSP. Then it assigns to this variable the value with the minimum conflicts. If there are more than one minimum, it chooses one among them randomly. After that, a new iteration starts again until a solution is found or a preselected maximum number of iteration is reached

**2. How many solutions are there for the three-color map-coloring problem in Figure 1? Elaborate your answer.[1.5 points]**

Suppose we have 3 colors, a,,b, c. Starting from WA, it can be colored by one of three colors.

Now NT can be colored from one of the other two colors.

And SA only have one choice.

Q,NSW,V all have only one choice.

T can be colored from one of three colors.

3\*2\*1\*1\*1\*1\*3=18

Can have 18 solutions in total.