Cpt S 350 Homework #8

Please print your name!

Let G be a directed graph with each edge assigned with a positive number called its *weight*. In particular, there is a designated node in G called the initial node and there is a designated node in G called the final node. Additionally, each edge is also decorated with a color in $\Sigma = \{red, yellow, green\}$. Try to sketch ideas in designing efficient algorithms for the following problems.

1. For a given number k, enumerating the first i-th shortest paths, for all $1 \leq i \leq k$, from the initial to the final.

2. Finding a shortest path that does not have a red edge immediately followed by a yellow edge.

3. For each path w from the initial to the final, one can collect the colors on the path and therefore, a color sequence $c(w)$ is obtained. Notice that, it might be the case that two distinct paths w and w' corresponds to the same color sequence; i.e., $c(w) = c(w')$. Computing the size of the set $\{c(w) : w$ is a path from the initial to the final$\}$.

4. For each path w from the initial to the final, one can multiply the weights on the path and therefore, a number $W(w)$ is obtained. Find a path w from the initial to the final such that $W(w)$ is minimal.