CSE-619: Assignment-2

Full Marks: 25

Deadline: September 26, 2024

1. Consider the MINIMUM MAXIMAL MATCHING problem which is defined as follows.

- **Input:** An undirected graph $G = (V, E)$ and an integer k.
- **Parameter:** k.
- **Question:** Is there a maximal matching M of G that has at most k edges?

Design an FPT algorithm for MINIMUM MAXIMAL MATCHING problem. Clearly explain the reduction rules, branching rules, and the running time analysis of your algorithm. For example, if your algorithm runs in $5^k poly(n)$-time, please write the 5^k part precisely. (**10 Marks**)

2. An undirected graph $G = (V, E)$ is called *perfect* if for every induced subgraph H of G, its chromatic number (minimum number of required colors for proper coloring) of H is the same as the clique number (the maximum possible size of a clique) of H. OCT PERFECT GRAPH is defined as follows.

- **Input:** G, k such that G is a perfect graph.
- **Parameter:** k.
- **Question:** Is there $S \subseteq V(G)$ such that $G - S$ is a bipartite graph?

Design an FPT algorithm for OCT PERFECT GRAPH that runs in $2^k poly(n)$-time. (**15 Marks**)