
Question 13. Give an FPT algorithm based on color-coding for the problem below. Bonus: show that it is NP-complete.

**Cheap Subtree**

| Input: | A complete binary tree $T$ with a set $L$ of leaves,  
|        | a graph $G = (V, E)$,  
|        | a cost function $c : V \times L \to \mathbb{N}$  
| Param.: $k = |L|$  
| Output: | A subset $V' \subseteq V$ such that:  
|         | $G[V']$ is isomorphic to $T$,  
|         | the total cost of the mapping between $V$ and $L$ is minimal. |

Question 14. Same question:

**Polychrome Matching**

| Input: | A graph $G$ with an $r$-edge coloring  
| Param.: $r$  
| Output: | A maximum-size set of independent edges of $G$ with pairwise-distinct colors. |

Question 15. Same question:

**Disjoint $r$-Subsets**

| Input: | Size-$r$ subsets $X_1, \ldots, X_m$ of $[n]$, integer $k$  
| Param.: $k + r$  
| Output: | $k$ pairwise disjoint subsets $X_{i_1}, \ldots, X_{i_k}$ |