1) Consider CONGEST(6) model, in which in every round up to 6 messages can be delivered through an edge. Analyze timecost of this model. How much time does it require?

2) Devise an alg for computing a shortest paths tree in a distributed weighted graph. Assume that on every round, O(1) edge weights can be delivered through every alg. Analyze its time and message complexities.
3) Below is a variant of Szemeredi-Trotter's color reduction.

Partition all color classes into sets of \( \Delta + 2 \) colors, \( \{1, 2, \ldots, \Delta + 2\}, \{\Delta + 3, \ldots, 2\Delta + 4\}, \ldots \).

In each color class, reduce in parallel one color via a naive color reduction.

We obtain a proper coloring with fewer colors. (Prove that it is proper. How many colors are used?) Analyze the color reduction, and analyze an iterated variant of this color reduction. How many rounds are required to reduce the number of colors from some \( \Delta \) to \( \Delta + 1 \)?
4) Devise a variant of Tulya's reduction from $(k+1)$-V-coloring to MIS for the case that $k$ do not know the value $\Delta = \max \{\text{deg}(v)\}$.

5) A graph $G$ has neighborhood independence $\leq t$ if for every $uv \in \text{E}(G)$, the set of its neighbors $N(u)$ does not contain an independent set of size $> t$.

Devise a variant of Tulya's reduction for graphs of bounded neighborhood independence.
6) Analyze the following centralized algorithm for computing a diameter of a tree: Pick a \( u \times v \), find a farthest \( u \times w \) from \( v \). Find the farthest \( u \times w \) from \( u \). Return \( \text{dist}(w, w) \) as the diameter of the input tree \( T \). Prove the correctness of the alg.

7) Devise a distributed alg' for edge-coloring a graph with max'm degree \( k \) in \( O(k^2) \) colors in \( \log^* n + O(1) \) time, without ceding towards alg' Good luck!

Enjoy!