Chip Design
SS 2008

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Exercise 2

1. Let T be a Steiner tree on a terminal set N. Prove that

$$\sum_{v \in N} \Big(|\delta_T(v)| - 1 \Big) = K_T - 1,$$

   where K_T is the number of full components in T. (6 points)

2. Prove that the following inequality holds for a net N with at most five (point-shaped) pins:

$$\text{steiner}(N) \leq \frac{3}{2} \text{BB}(N).$$

   (6 points)

3. Let P be a set of pins, and let $\mathcal{R}_p$ be a set of axis-parallel rectangles for each $p \in P$. We search for a rectangle B with minimum perimeter such that for every $p \in P$ there is an $R \in \mathcal{R}_p$ with $B \cap R \neq \emptyset$. We denote $n := \sum_{p \in P} |\mathcal{R}_p|$.

   (a) Show that such a rectangle B can be computed in $O(n^4)$. (2 points)

   (b) Show that such a rectangle B can be computed in $O(n^3)$.
   (Hint: Enumerate all reasonable coordinates for the lower left corner of B.) (6 points)

The deadline of the exercise return is April 24, before the exercise.