1. [4+4+4 points] Each of the following pairs of concepts are somehow connected. Describe the main connecting factors or commonalities as well as the main separating factors or differences.

   (a) LSD radix sort and MSD radix sort.
   (b) Shift–And algorithm and BNDM algorithm.
   (c) Suffix array and Burrows–Wheeler transform.

A few lines for each part is sufficient.

2. [6+7 points] Tries and data structures based on tries (e.g., suffix tree) involve an operation called child.

   (a) Describe the child-operation and explain why its implementation is an important and non-trivial issue.
   (b) List different approaches for dealing with the problem together with the main advantages and disadvantages of each approach.

3. [12 points] Use Ukkonen’s cut-off algorithm to find all approximate occurrences of $P = \text{levee}$ in $T = \text{elevated \_water \_level}$ with edit distance $k = 1$.

4. [13 points] Let $T$ be a string of length $n$ over an alphabet $\Sigma$ of constant size. Describe an algorithm that finds the shortest string over the alphabet $\Sigma$ that occurs exactly $k$ times in $T$. The time complexity should be $O(n)$. 