Algorithm Engineering
13 June 2022 – time 45 minutes

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Question #1 [ranks 4+5]. Given the integer sequence

S = (1, 2, 4, 6, 7, 8, 9),

show how

- Interpolative Coding compresses the "first three" integers according to its algorithm.
- Elias-Fano compresses all integers of S

Question #2 [ranks 4+5]. Given the Canonical Huffman code defined with the following tables, whose values are specified for increasing levels, counted from 1.

Symb[4] = { [], [a, e, f], [c], [d,b]}
FC[4] = {2, 1, 1, 0}

- Illustrate the Canonical Huffman Tree derived from the two tables.
- Detail the decompression of the first 2 symbols of the compressed file 10001, by showing the steps applied by the decompression algorithm and using **ONLY** the tables FC and Symb.

Question #3 [ranks 4+4]. Given the binary strings

S={011, 10010, 10011, 101}.

- Build the Patricia Trie for S
- Show how to search for the lexicographic position of the string P=110 among the strings of S.

Question #4 [rank 4]. Given the sequence of 6 items S = (a, b, c, d, e, f) use the random sampling algorithm with known sequence length n=6, to compute the m=2 extracted items given the random values p = (1/2, 1/10, 3/4, 3/4, 0, 1)