1. Decoder Design

Design a 6-to-64 memory decoder for use with your memory array. The input loading of each of the true and complementary address lines is constrained to be less than 3fF. The output loading of the decoder is determined from the wordline loading by the memory cells (extracted from phase I) and the capacitive wireload (estimated by hand). You can ignore the wire resistance. The length of the wordline can be determined from the horizontal dimension of the cell, see Figure 1.

The decoding is performed in two phases: predecoding of 3 input bits and the final row decoding of 2 bits. The enable signal EN, is active high and enables the decoder outputs. The predecoder drives the final wordline decoders together with the wire that whose length equals the height of the memory array.

The goal is to minimize the delay/energy of the decoder. Keep in mind that the decoder layout has to match the SRAM word pitch. The logic structure and the number of logic levels in Figure 1 is not fixed, and you can exchange e.g. NANDs with NORs or add or remove inverters.

![SRAM decoder](image.png)

Figure 1: SRAM decoder.
2. Prelab
Before coming into your lab session, manually design the decoder for the minimum delay. Prepare one page document with a diagram of the decoder with all transistor sizes annotated. Show your sizing approach. Turn in your calculation to your GSI in the beginning of the lab session.

3. Decoder – schematic and layout
In Cadence, enter the schematic of the decoder. Design the layout of the decoder. Perform this for one wordline, and then extend it to assemble the complete decoder. Simulate the delay from one address input to the wordline.

4. Report
The total report should not contain more than three pages. You are not allowed to add any other sheets. The organization of the report should be based on the following outline:

   Cover page: Names, project title, summary of the parameters that include the estimated decoder delay.


   Page 3: Schematic and layout in Cadence.

Grading:
10% Prelab
30% Approach and correctness
20% Results
30% Report
10% Creativity