ECE 27000 Spring-22
Homework 8

Solve the following problems.

1. Consider the implementation of a 4-to-16 binary decoder using 2-to-4 binary decoders from the lecture notes. Using the internal structure of a 2-to-4 binary decoder, show the gates implementing Y0, Y5, Y10 and Y15. Compare to the internal structure of 4-to-16 binary decoder.
2. Extend the seven-segment decoder from the lecture notes to display each one of four capital letters of your choice. Write the truth table and the logic expression for two outputs of your choice.
3. Construct a 5-to-32 binary decoder using a 2-to-4 decoder and multiple 3-to-8 decoders.
4. Implement $F = \Sigma A,B,C,D(0,2,7,8)$ using 4-16 decoder and OR gate.
5. Differentiate between decoder and demultiplexer. How can you build a demultiplexer from a decoder?
6. Write the output functions for a 16-to-4 encoder, and for a 32-to-5 encoder in terms of the inputs.
7. Construct an 8-to-1 multiplexer using only 2-to-1 multiplexers.
8. Construct an 32-to-1 multiplexer using an 4-to-1 multiplexer and multiple 8-to-1 multiplexers.
9. An XNOR function is described as follows:

   Output is asserted when an even number of input signals are asserted. Implement the XNOR function using a 1-bit, 8-input multiplexer.
10. Write a Sum-of-Products Expression for F in the following circuit: