ShanghaiTech University

EE 115B: Digital Circuits

Fall 2022

Homework 4

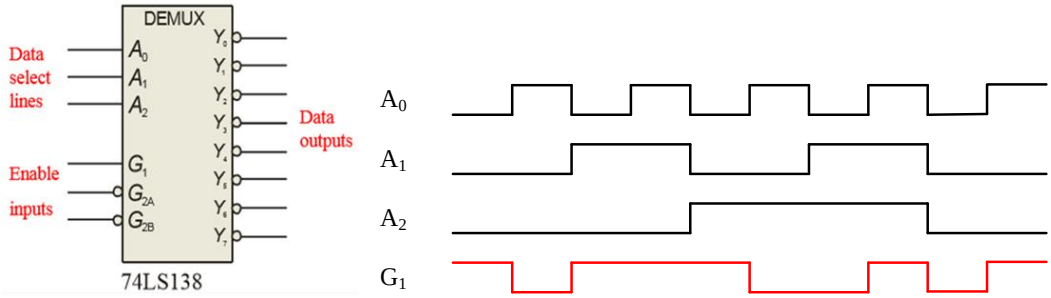
Total: 100 Points

Assigned: November 13, 2022. Due: November 20, 2022.

1. Convert the following AND-OR expression to NAND, AND-OR-Invert (AOI), and NOR expressions. (30 points. 10 points each.)

$$\boldsymbol{Y(A,B,C) = A\bar{B}C + B\bar{C}}$$

2. Design a circuit to implement the following functionality: the output Z is 1 if three or four of the inputs (A, B, C, and D) are 1. You need to (a) build the truth table, (b) derive the minimum SOP (i.e., AND-OR) expression, and (c) draw the circuit diagram based on the minimum AND-OR expression. (30 points. 10 points each.)
3. Plot the output (Y_0 through Y_7) waveforms given the following inputs to the 3-8 decoder (also a DEMUX) 74LS138. The enable inputs G_{2A} and G_{2B} are set as LOW all the time. (32 points. 4 points each.)



4. Plot the output (Y) waveform given the following inputs to the 4-to-1 MUX. (8 points.)