

HW4-1

1. (32%) Design a combinational circuit with unsigned four-bit binary input, ABCD (MSB:A, LSB:D), and unsigned four-bit binary output, wxyz (MSB:w, LSB:z). When the binary input is less than 0110, the binary output is 0010 greater than the input (for example, ABCD:0010 \Rightarrow wxyz:0100). When the binary input is greater than 1001, the binary output is 0110 less than the input (for example, ABCD:1110 \Rightarrow wxyz:1000). For other values of the binary input, the output equals the input.
 - (a) Derive the truth table. (8%)
 - (b) Derive the simplified Boolean expressions for w, x, y, z using maps. (16%)
 - (c) Draw the related logic diagram. (8%)
2. (18%) Design a four-bit 2's complementer with simplified Boolean function and logic diagram. (The output generates the 2's complement of the input binary number.)
3. (10%) Design a 4x4 unsigned binary multiplier.