Indian Institute of Technology, Delhi
EEL 201: Digital Electronic Circuits
Tutorial 4, 24th August, 2009

1. Construct the truth table of an octal-to-binary priority encoder. Provide an output V to indicate that at least one of the inputs is present. The input with the highest subscript number has the highest priority. From the truth table, construct a logic circuit for the priority encoder.

2. A majority circuit is a combinational circuit that outputs 1 when the input variables have more 1s than 0s, and vice versa. Design a 5-input majority circuit, by identifying a truth table, and a boolean equation.

3. Design a combinational circuit with three inputs, x, y, z, and three outputs, A, B, C. When the binary input is 4, 5, 6, or 7, the binary output is 2 less than the binary input. When the binary input is 0, 1, 2, or 3, the output is 4 more than the binary input.

4. Design a four-bit combinational circuit 2's complementer. (The output generates the 2's complement of the input binary number.) Show that the circuit can be constructed with XOR gates. How will you design a 5-bit 2's complementer?

5. Construct a 5-to-32 line decoder with four 3-to-8 line decoders (with enable) and a 2-to-4 line decoder. Use block diagrams for the different components.

6. Design a combinational circuit that generates the 9's complement of a BCD digit.

7. Construct a BCD adder-subtractor circuit. Use block diagrams for the different components.

8. Assume that every XOR gate has a propagation delay of 10 ps, and every AND or OR gate has a propagation delay of 5 ps. Draw a block diagram of a 16-bit carry-look-ahead type adder. How much time does the adder require to do one addition? Draw a block diagram of a 16-bit ripple-carry adder. How much time does the ripple-carry adder take to complete one addition?