Problems

1. (Horowitz and Hill, problem 8.13) Draw a Karnaugh map for logic to determine if a 3-bit integer (0 to 7) is prime (assume that 0, 1, and 2 are not prime). Show a realization with 2-input gates.

2. (H & H, problem 8.17) Show how to make a 4-input multiplexer using ordinary 2-input gates.

3. (H & H, problem 8.20) Design a “simple” encoder: a circuit that outputs the 2-bit address telling which of 4 inputs is HIGH (all other inputs must be LOW and there is always one HIGH input). Use standard 2-input gates, i.e., NOT, AND, OR, NAND, NOR or XOR.

4. Design a divide-by-4 counter using $D$ flip-flops and logic gates. The flops should be clocked synchronously. Draw a timing diagram showing the state of all flop outputs at each clock pulse which verifies your divide-by-4 design.

5. (H & H, problem 8.27) Design a circuit that lets exactly one full negative pulse (from an input train of pulses) pass through to the output after a button is pushed. Wire the button into the circuit through a de-bouncer.