

## Ch 3.2 Basic Logic Circuits

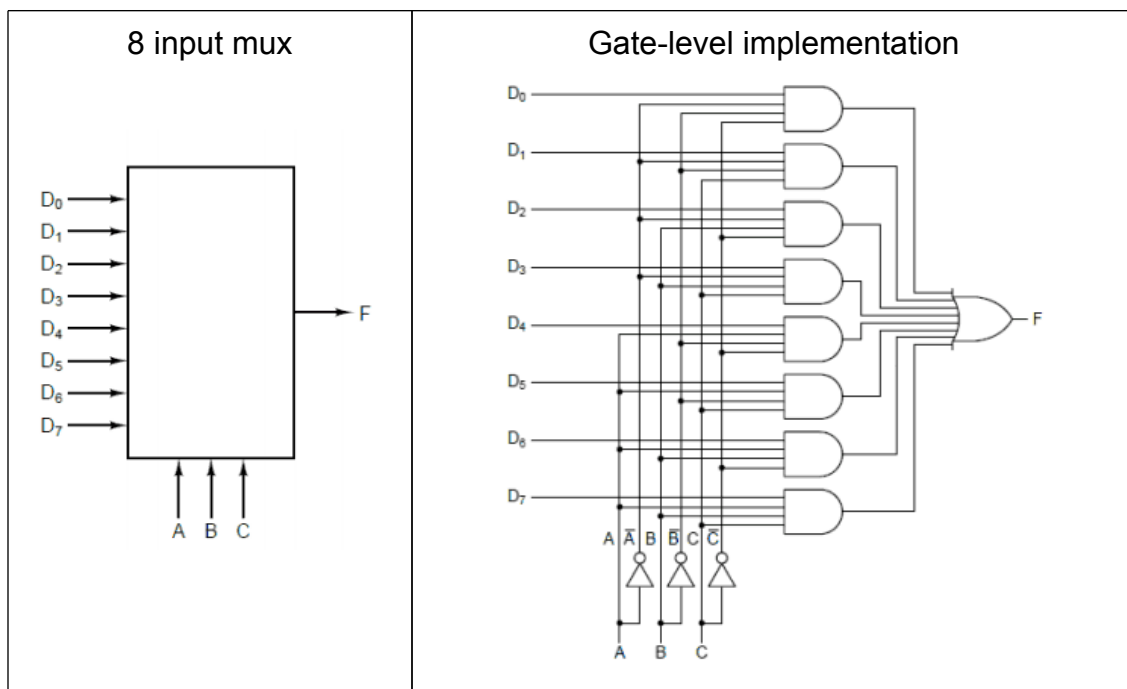
NOTE09: Basic logic circuits used in data path design

Text reference: **Section 3.2**

**combinational circuit** - N inputs means  $2^N$  possible outputs (ala truth table and CSC 230), no memory as output is only dependent on the current value of inputs

Common logic circuits: multiplexer (mux), decoder, comparator, shifter, adder, ALU

**Mux** -  $2^N$  data inputs, N control inputs, 1 output... output = selected data input



**Decoder** - N inputs,  $2^N$  outputs... only one output (the Nth) is true at any time

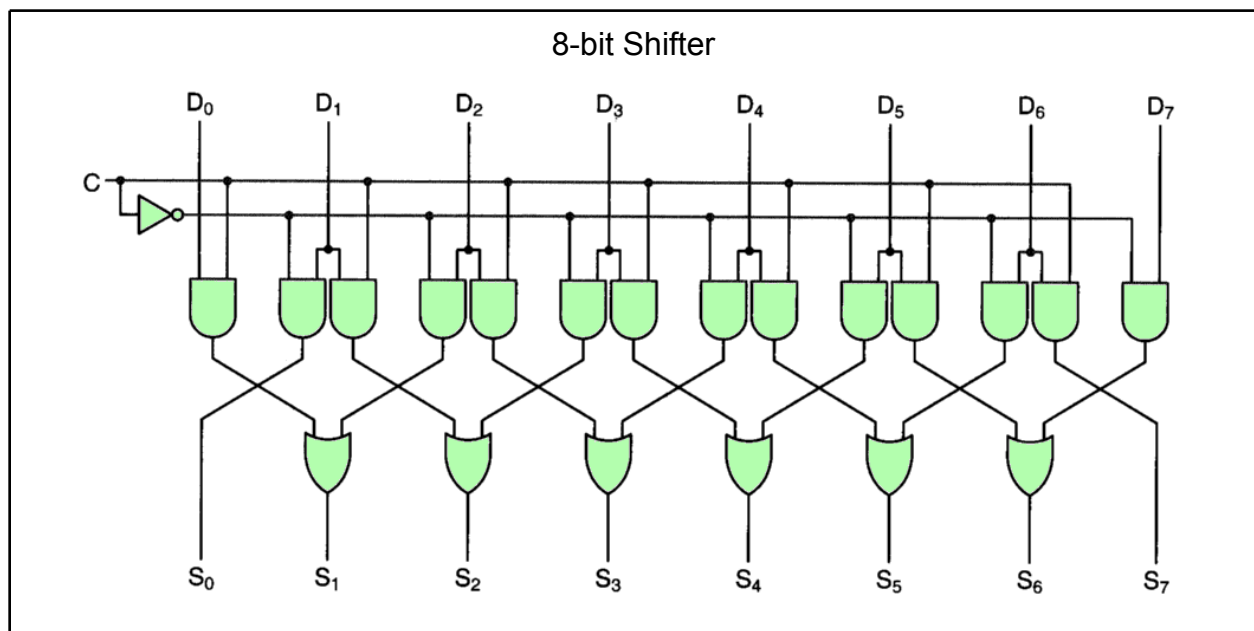
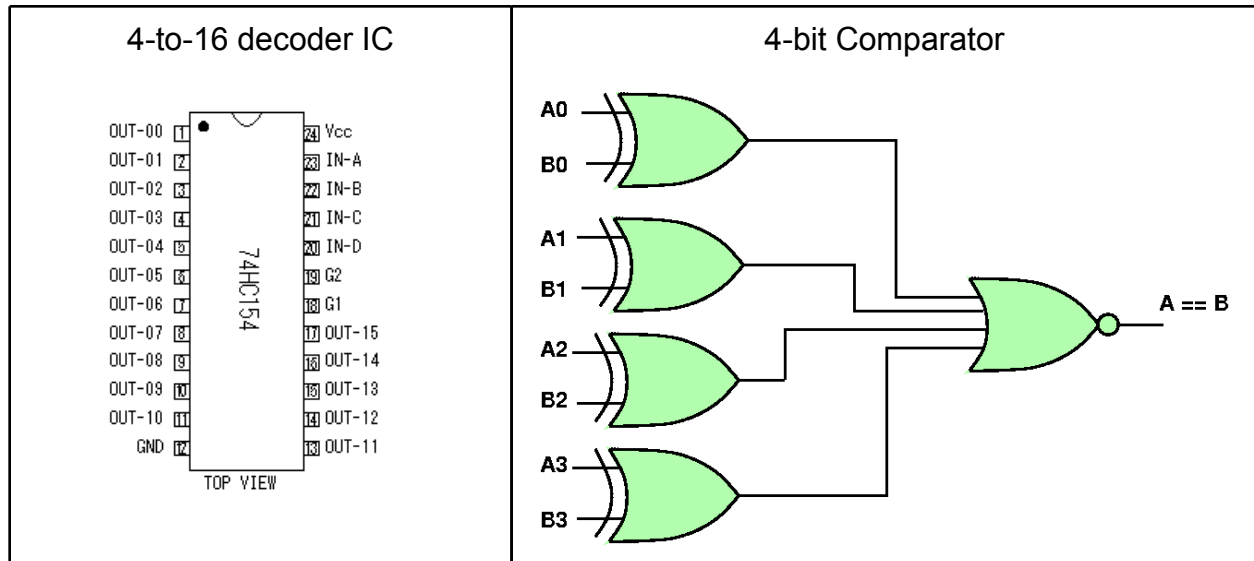
**Encoder** -  $2^N$  inputs, N outputs... opposite of decoder

**Comparator** - 2 N-bit inputs, 1 output... output true if each bit of inputs is equal, XOR!

**Shifter** - N input bits, N output bits... shift bits left or right

**Adder** - {SUM, COUT} =  $A + B + CIN$ ... half adder, full adder, ripple carry adder

**ALU** - Arithmetic Logic Unit... general-purpose/centerpiece component of datapath, performs Boolean and math operations



**clocks** - datapath designs are synchronous, data is accepted by memory element on a clock edge... memory elements covered in next section, 3.3

The ALU on page 167 will be the focus of future datapath designs in our book AND our Program #2. Huzzah!