CMSC 130 – Logic Design and Digital Computer Circuits
Handout # 7: MIXED LOGIC (COMBINATIONAL CIRCUIT BUILDING BLOCKS)

Building Blocks:

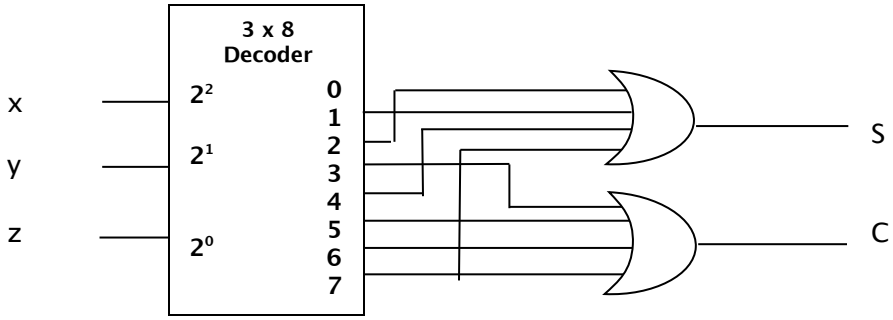
1. Adder
2. Subtractor
3. Comparator
4. Decoder
5. Encoder
6. Multiplexer
7. Demultiplexer
8. Code Converter
9. Parity Checker

Decoder

A combinational circuit that converts binary information from n input lines to a maximum of 2^n unique output lines.

Example: Implementing a full-adder with a decoder and external OR gates

$S(x,y,z) = \Sigma\ (1,2,4,7)$
$C(x,y,z) = \Sigma\ (3,5,6,7)$



Multiplexer

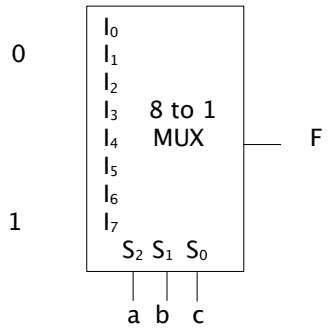
A combinational circuit that selects binary information from one of many input lines and directs it to a single output line; selection of a particular input line is controlled by a set of selection variables.

Two forms:

1. Logical form (with n selection lines)
2. Functional form (with n-1 selection lines)

Example: Implement the function $F(a,b,c) = \Sigma(0,1,6,7)$ using a MUX in
(a) Logical form and
(b) Functional form

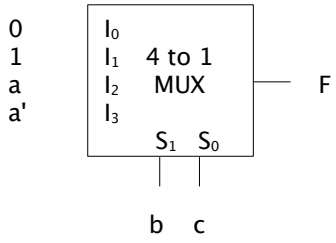
(a) Logical form (Use an 8-to-1 MUX)



(b) Functional form (Use a 4-to-1 MUX)

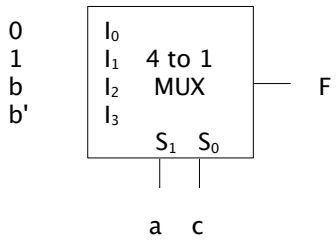
Using **a** as input:

	I_0	I_1	I_2	I_3
a'				
a				



Using **b** as input:

	I_0	I_1	I_2	I_3
b'				
b				



Using **c** as input:

	I_0	I_1	I_2	I_3
c'				
c