

In Class exercises – Week 3

Circuits (Cedar Logic) – Exercise2.cdl file

Exercise2.cdl: Page1, Page 2 – recall Adder, MUX, Decoder

- Page 1:
 - One bit full adder
 - schematic for 4-bit full adder
 - Inputs: 4-bit numbers X,Y and Carry-in bit and Output is 4-bit number
 - Input using 4-bit hex keypad; output shown on 7-segment display (displays Hex number)
- Page 2:
 - Multiplexer: 4-1 MUX. One of 4 inputs is sent to output depending on 2-bit select lines
 - Decoder: 2-4 decoder. One of 4 outputs is selected (set to a 1) based on 2-bit input

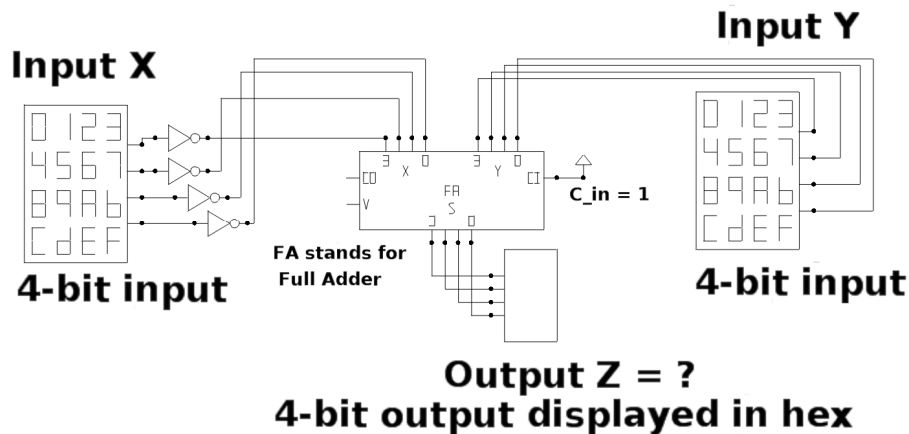
Question 1: Page 3 – What does this circuit do? What is the function Z ?

- 4-bit adder, two 4-bit inputs X,Y

Answer: $Z = Y - X$ (X is complemented and then 1 is added by setting $C_{in}=1$ therefore $Z = Y + (\text{NOT } X) + 1$, but $(\text{NOT } X)+1$ is 2's Comp of $X = -X$)

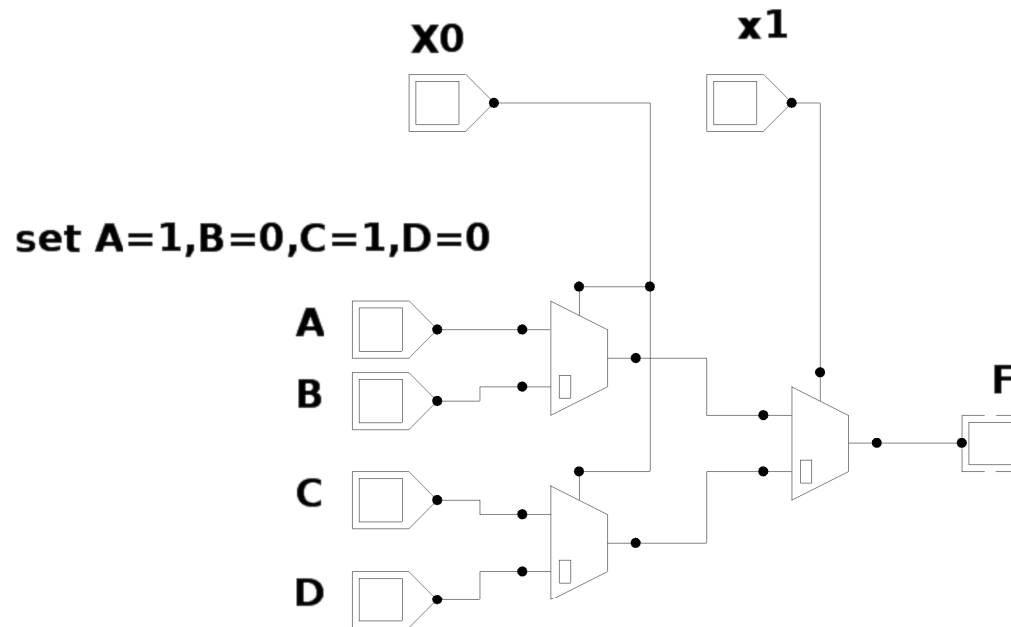
**Question 1 What does this circuit do ?
What is the function Z?**

Assume inputs X,Y are 4-bit 2's Complement Nos.



Question 2: Page 4 - What does this circuit do? What is the function F ?

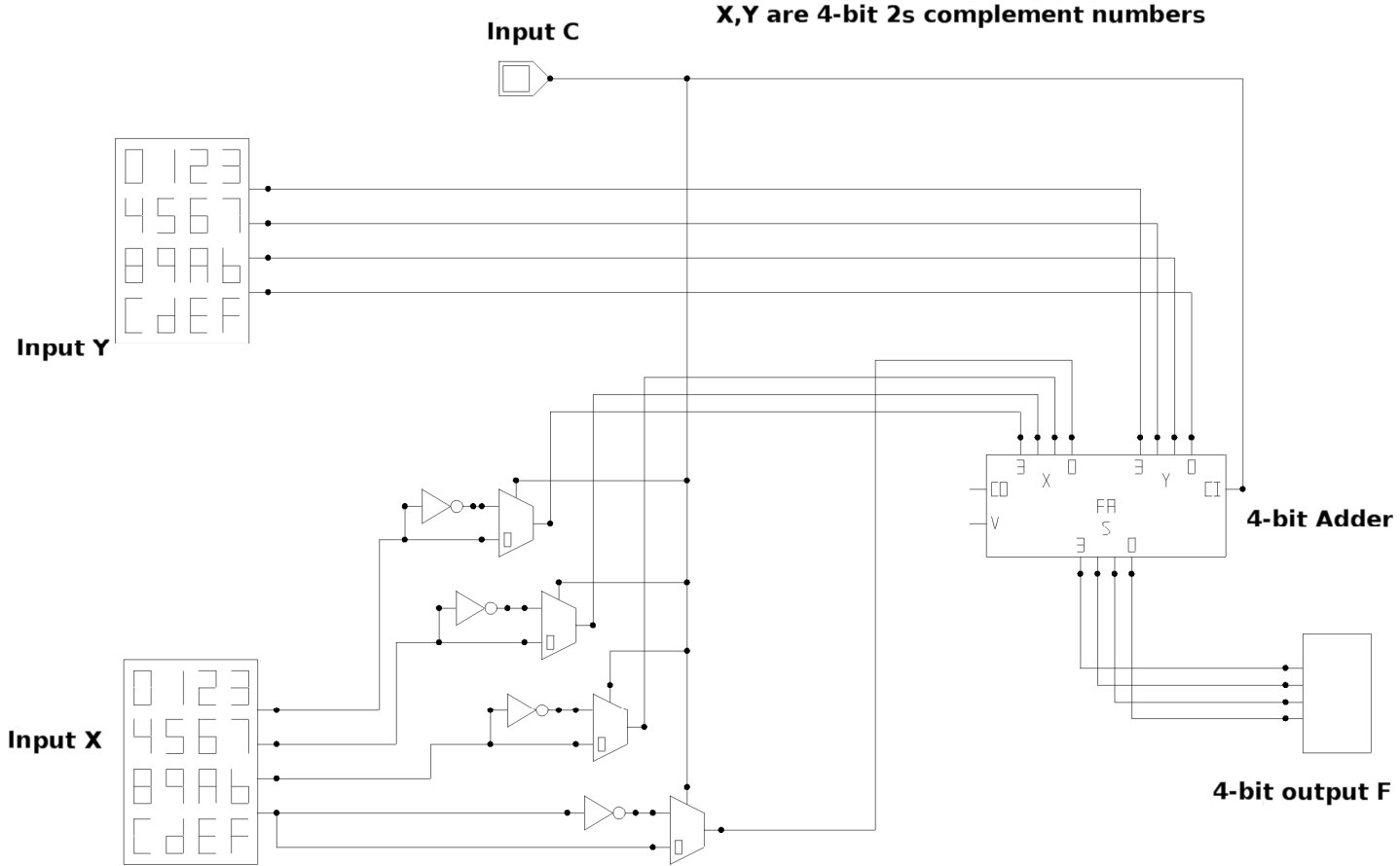
- What is the function F – for all combinations of x_0, x_1
- Inputs: A,B,C,D, and x_0, x_1
- Answer: This implements a 4-1 MUX using 2-1 MUXes..
- Output=A if $x_0x_1=11$, B if 01, etc..



MUX notation: Input at line 0 is selected if select line=0

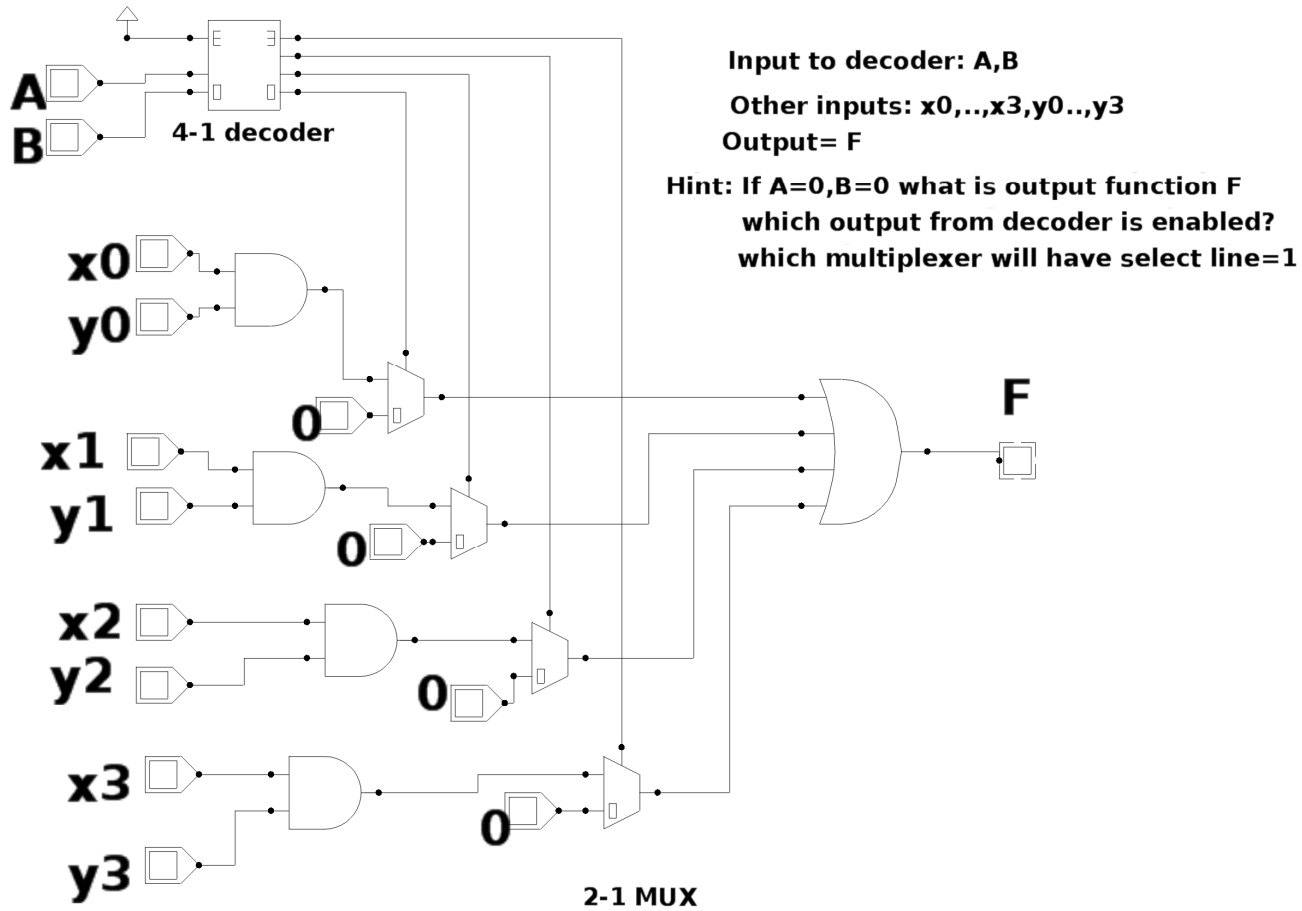
Question 3: Page 5 – Describe what this circuit does?
Inputs are X,Y,C and output is F

- X,Y are 4-bit inputs in 2's complement binary
- If C=1 then Y-X else Y+X



Question 4: Page 6 – Describe the function F computed by the circuit.

- Input to 4-1 decoder is A,B
- Other inputs: x_0, x_1, x_2, x_3 and y_0, y_1, y_2, y_3
- If $AB=00$ then $F= x_0.y_0$, if $AB=10$ then $F=x_2.y_2$, etc.

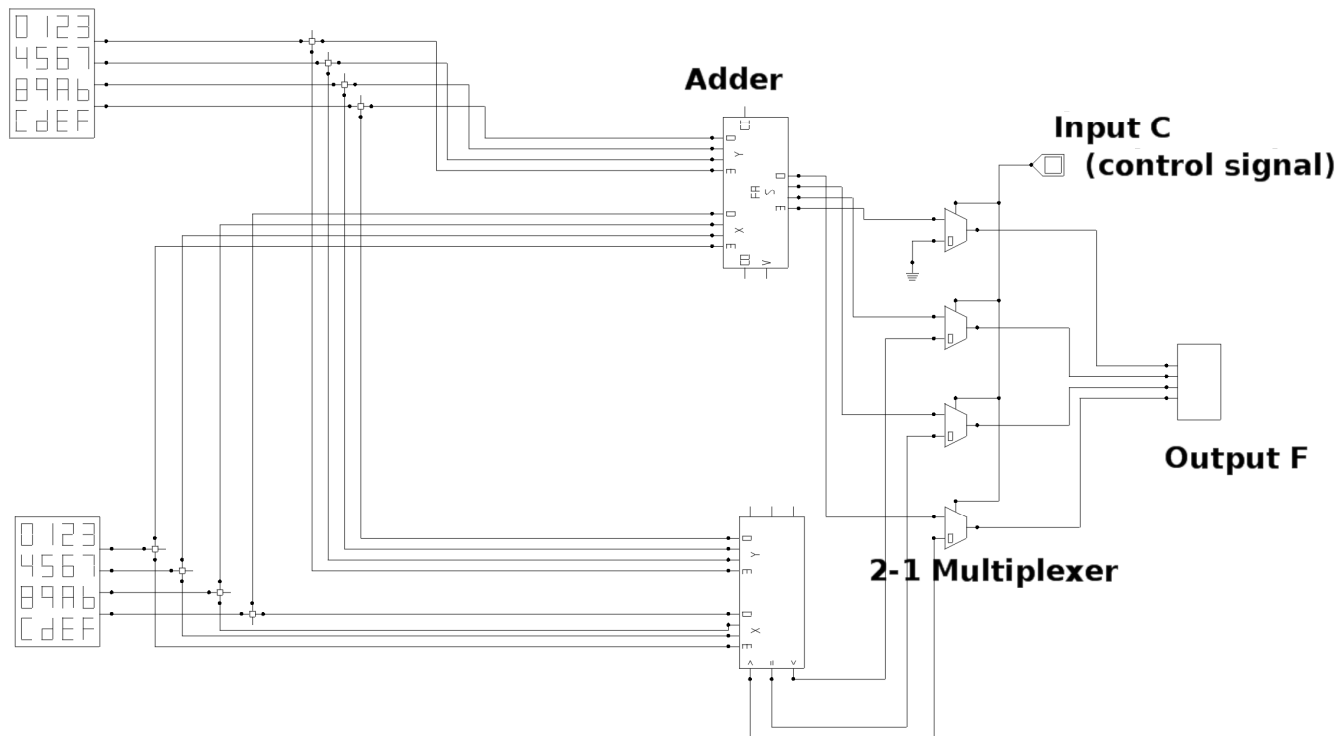


Question 4: Page 7 – What does this circuit do ? Inputs: C, X, Y (X,Y are 4-bit 2C numbers)

4-bit output F is displayed as a Hex digit

- Circuit has Adder and Comparator
- 2-function “ALU” ...C determines Add or Compare

Number Y



Number X

Comparator: one of three outputs is a 1
Signal at > is 1 if X>Y, E is 1 if equal, < is 1 if X<Y
(output=1 if X>Y, 2 if X=Y, 4 if X<Y)