Department of Computer Science & Engineering (CSE)

Course Title: Digital Logic Design

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Course Code: CSE 103
Credit Hr: 3.00
Contact Hr: 3.00

Overview

- What is MSI and PLD?
- Binary parallel Adder
- Binary Adder-Subtractors
- Carry Propagation
- BCD Adder
- Magnitude Comparator
- Decoders and De-multiplexers
- Encoders and Multiplexers
- Priority Encoders

Magnitude Comparator

- The comparison of two numbers is an operation that determines if one number is greater than, less than or equal to the other number.

- A magnitude comparator is a combinational circuit that compares two numbers A and B.

- The outcome of the comparison is specified by 3 binary variables that indicate whether $A>B$, $A=B$ or $A<B$

Magnitude Comparator: A=B

Consider two numbers, A and B

- $A=A_3\ A_2\ A_1\ A_0$
- $B=B_3\ B_2\ B_1\ B_0$

- Now, two numbers are equal if $A_3=B_3$ and $A_2=B_2$ and $A_1=B_1$ and $A_0=B_0$
- As the numbers are binary, the digits are either 0 or 1.
- Let, A = 1011, B = 1011
- A3=B3=1 or A3'=B3'=1
- $x_i = A_iB_i + A_i'B_i' = A_i \text{ xnor } B_i$;where, i=0,1,2,3
- Let i=0
- x_0 will be equal to 1 if either ($A_0 = B_0 = 1$) or ($A_0 = B_0 = 0$)
- So, $x_0 = A_0B_0 + A_0'B_0'$
- Same for X_3, X_2, and X_1
- Finally, $(A=B) = X_3X_2X_1X_0$

Magnitude Comparator: A>B

Consider two numbers, A and B

- $A = A_3\ A_2\ A_1\ A_0$
- $B = B_3\ B_2\ B_1\ B_0$
- Now, A>B if
  - A3>B3 or
  - A3=B3 and A2>B2 or
  - A3=B3 and A2=B2 and A1>B1 or
  - A3=B3 and A2=B2 and A1=B1 and A0>B0

- Let, A = 1110, B = 0010

- Now, as we know
- $x_i = A_iB_i + A_i'B_i' = A_i \text{ xnor } B_i$;where, i=0,1,2,3
- $(A_0=B_0) = x_0 = A_0B_0 + A_0'B_0'$
- $(A_1=B_1) = x_1 = A_1B_1 + A_1'B_1'$
- $(A_2=B_2) = x_2 = A_2B_2 + A_2'B_2'$
- $(A_3=B_3) = x_3 = A_3B_3 + A_3'B_3'$
- Finally, $(A>B) = A_3B_3' + x_3.A_2B_2' + x_3.x_2.A_1B_1' + x_3.x_2.x_1.A_0B_0'$

Magnitude Comparator: A<B

Consider two numbers, A and B

- $A=A_3\ A_2\ A_1\ A_0$
- $B=B_3\ B_2\ B_1\ B_0$

- Now, A<B if
  - A3<B3 or
  - A3=B3 and A2<B2 or
  - A3=B3 and A2=B2 and A1<B1 or
  - A3=B3 and A2=B2 and A1=B1 and A0<B0

- Let, A = 1001, B = 1011

- Now, as we know,
- $x_i = A_iB_i + A_i'B_i' = A_i \text{ xnor } B_i$;where, i=0,1,2,3
- $(A_0=B_0) = x_0 = A_0B_0 + A_0'B_0'$
- $(A_1=B_1) = x_1 = A_1B_1 + A_1'B_1'$
- $(A_2=B_2) = x_2 = A_2B_2 + A_2'B_2'$
- $(A_3=B_3) = x_3 = A_3B_3 + A_3'B_3'$
- Finally, $(A<B) = A_3'B_3 + x_3.A_2'B_2 + x_3.x_2.A_1'B_1 + x_3.x_2.x_1.A_0'B_0$

Magnitude Comparator

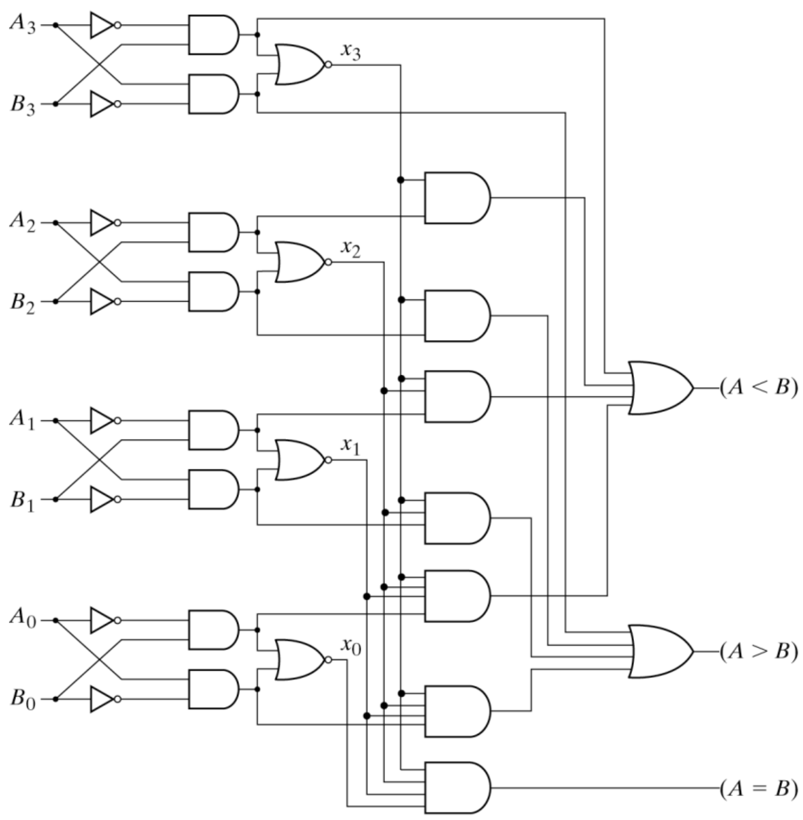

Fig. 4-17 4-Bit Magnitude Comparator


GOOD NEWS!
THE CLASS IS OVER…
THANK YOU!