Logic Gate

College of
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Level 1 , Semester 1
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Comparator , Decoder

Comparators

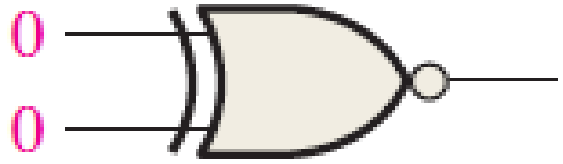
The function of a comparator is to compare the magnitudes of two binary numbers to determine the relationship between them.

In its simplest form, a comparator circuit determines whether two numbers are equal.

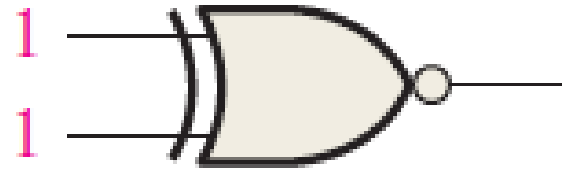
Thus, in the simplest form, a comparator can test for **equality** using **exclusive NOR gates**. (**why ?**)

In exclusive-NOR gate, the output is a 0 if the two input bits are not equal and a 1 if the input bits are equal.

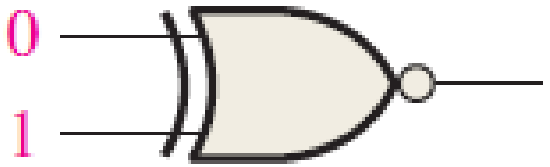
A Basic Comparator



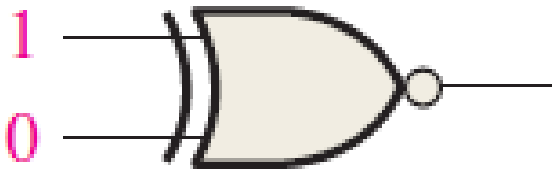
The input bits are equal.



The input bits are equal.



The input bits are not equal.

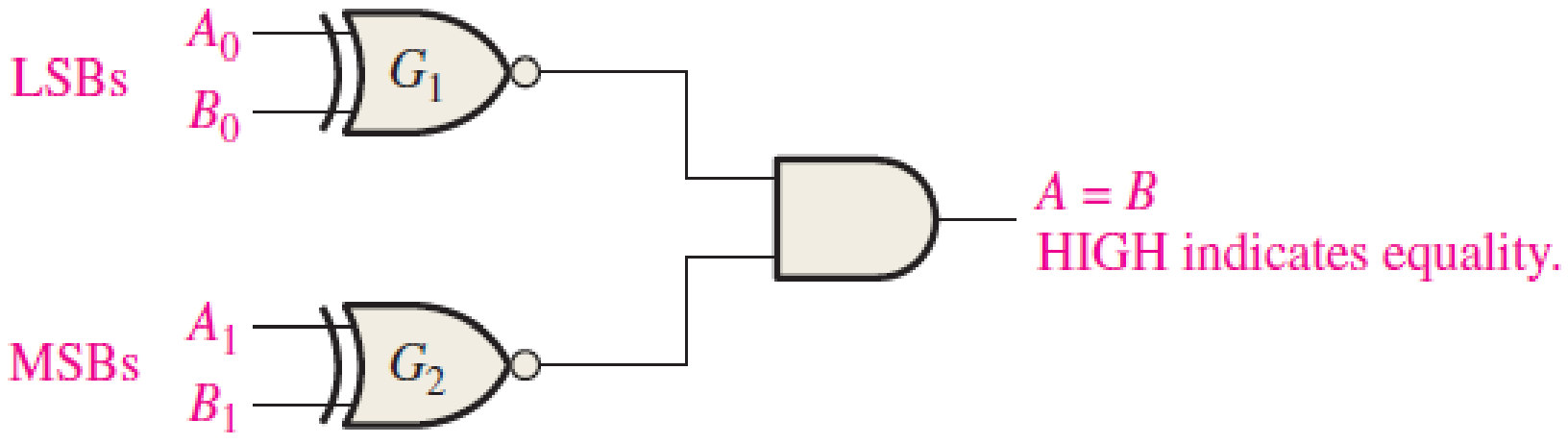


The input bits are not equal.

Comparators

In order to compare binary numbers containing two bits each, an additional exclusive-NOR gate is necessary.

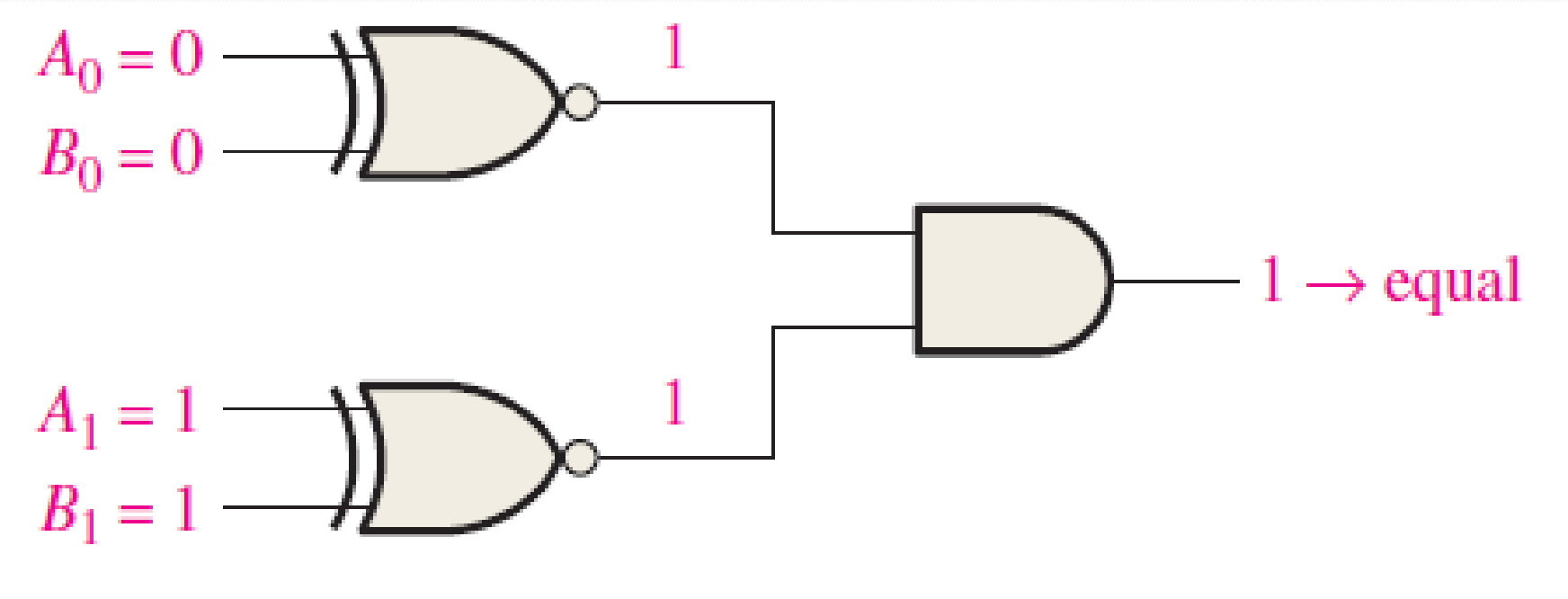
The two least significant bits (LSBs) of the two numbers are compared by gate *G*1, and the two most significant bits (MSBs) are compared by gate *G*2.



General format: Binary number $A \rightarrow A_1A_0$
Binary number $B \rightarrow B_1B_0$

Comparators

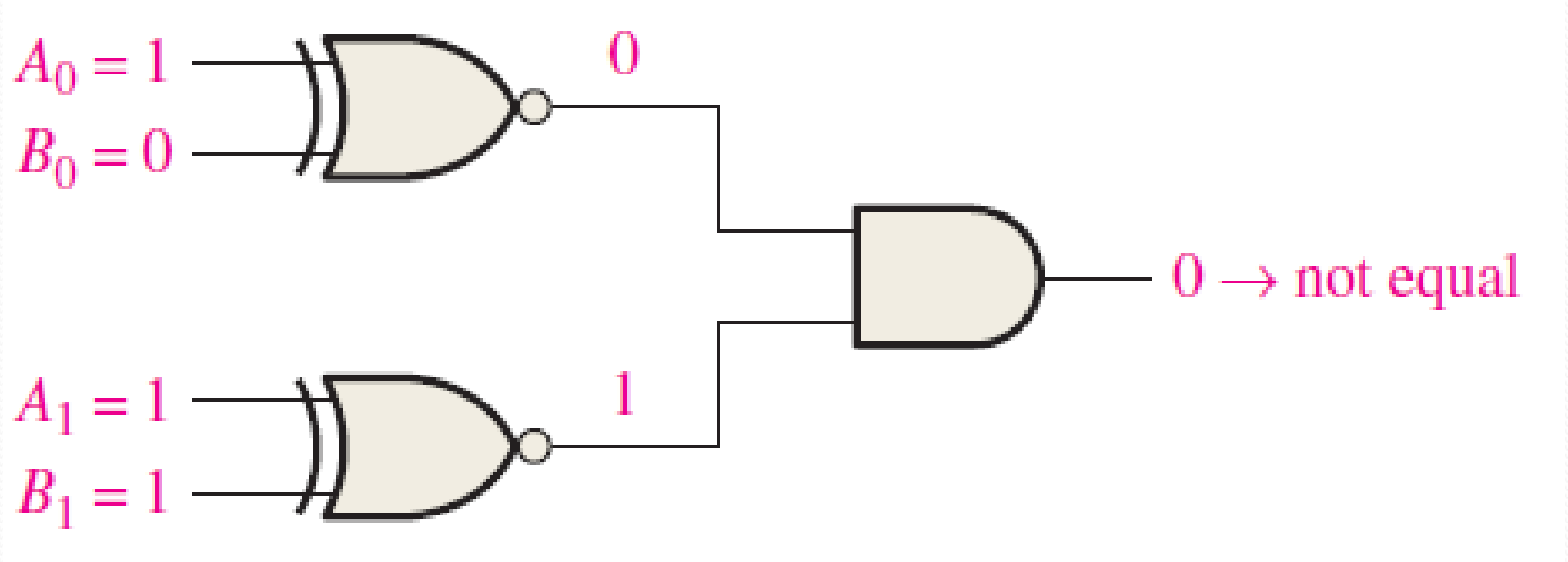
Example 1:- Apply the (**10**) and (**10**) binary numbers to the comparator inputs given below, and determine the output by following the logic levels through the circuit.



Solution: The output is **1** for inputs 10 and 10

Comparators

Example 1:- Apply the (**10**) and (**11**) binary numbers to the comparator inputs given below, and determine the output by following the logic levels through the circuit.



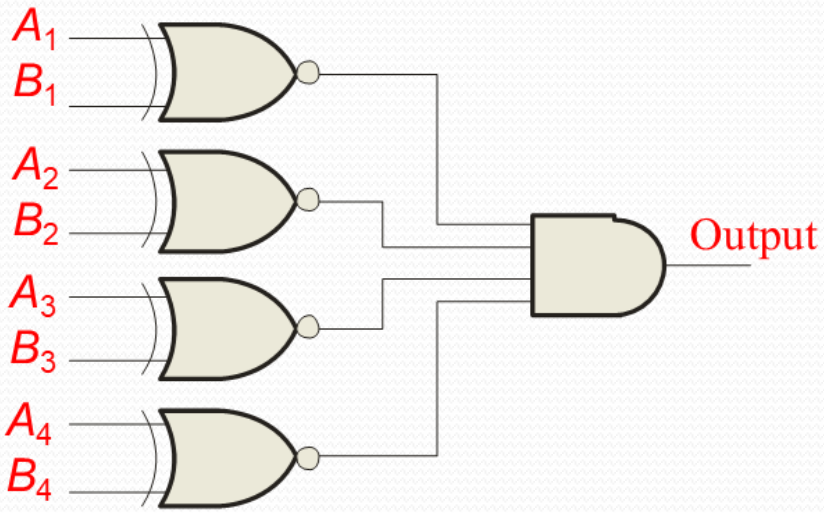
Solution: The output is **0** for inputs 11 and 10

Comparators

The function of a comparator is to compare the magnitudes of two binary numbers to determine the relationship between them. In the simplest form, a comparator can test for equality using XNOR gates.

Example How could you test two 4-bit numbers for equality?

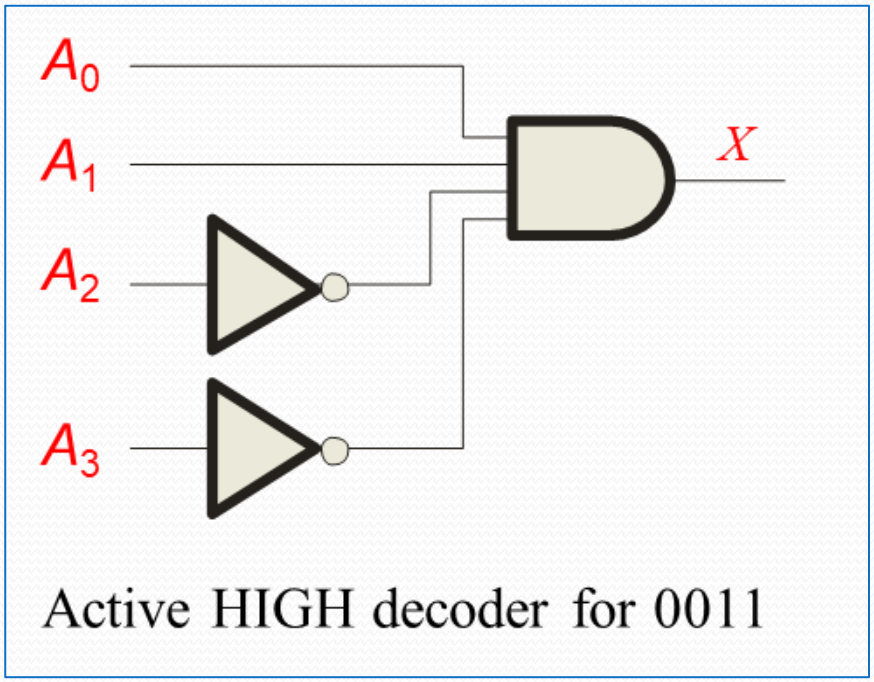
Solution AND the outputs of four XNOR gates.



Decoders

A **decoder** is a digital circuit that detects the presence of a specified combination of bits (code) on its inputs and indicates the presence of that code by a specified output level.

A simple decoder that detect the presence of the binary code 0011 is shown below:-

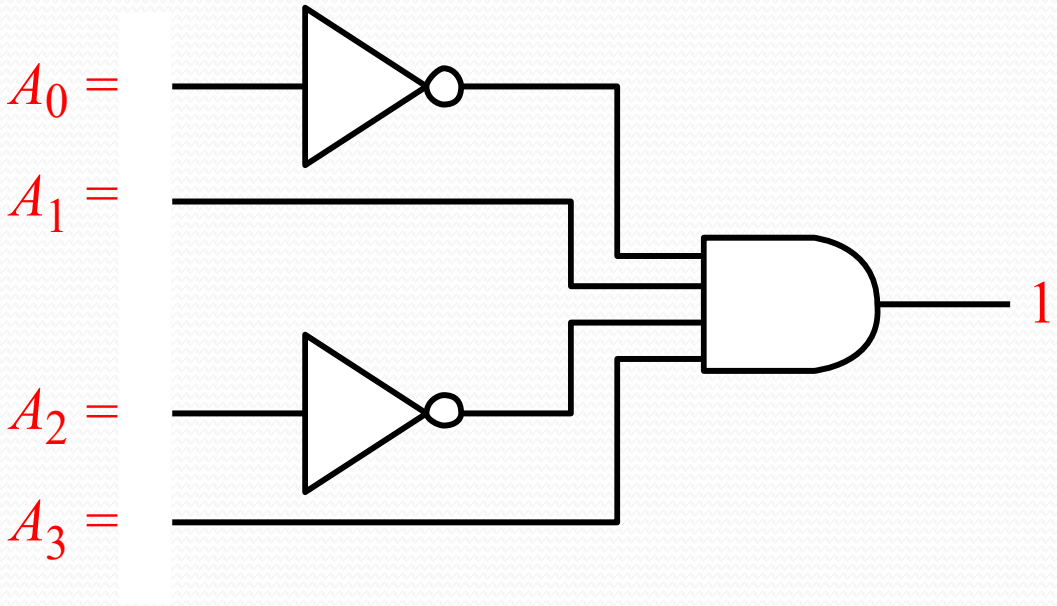


Active HIGH decoder for 0011

Decoders

Question

Assume the output of the decoder shown is a logic 1. What are the inputs to the decoder?



تمارین

Quiz

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