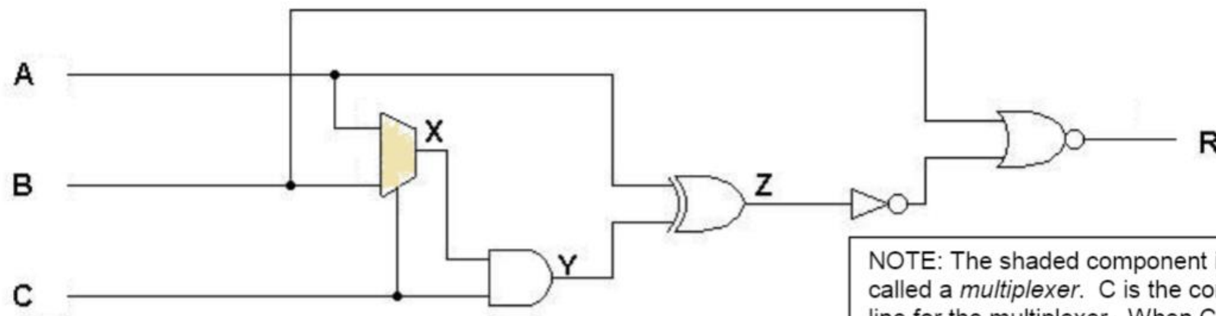
CS 271 Computer Architecture and Assembly Language

Self-Check for Lecture#18

Solutions are posted



NOTE: The shaded component is called a *multiplexer*. C is the control line for the multiplexer. When C = 0, A is selected, so X = A. When C = 1, B is selected, so X = B.

1. Show the truth table for the circuit shown above. Columns X, Y, and Z are for your convenience if you want to save intermediate results.

A	B	C	X	Y	Z	R
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	1	1	1	0
1	0	0	1	0	1	1
1	0	1	0	0	1	1
1	1	0	1	0	1	0
1	1	1	1	1	0	0

2. Find a Boolean equation to describe the circuit shown above.

$R = A\overline{B}\overline{C} + A\overline{B}C$ **Use Lines where R = 1**

3. (Optional Challenge) Reduce R to its simplest form. Show your simplification steps.

$R = A\overline{B}(\overline{C} + C)$ **Distributive Law**

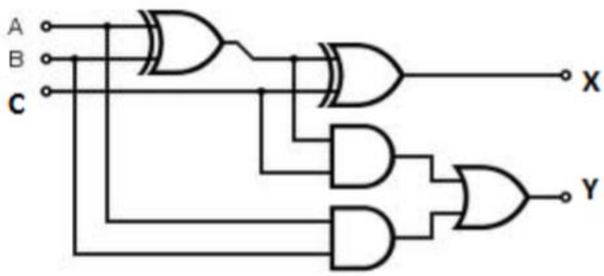
$R = A\overline{B}(1)$ **Inverse Law**

$R = A\overline{B}$ **Identity Law**

4. It takes one clock cycle to perform an addition operation in the 4-bit ripple-carry adder (see Lecture slide page 7). How many clock cycles will it take for one addition instruction to be executed in a 64-bit ripple-carry adder?

______1_______ clock cycles

5. The circuit below should be familiar to you, even though it is in a slightly different configuration from the lecture. What does the circuit do? What are the inputs? What results are expected at X and at Y?



It's just a full adder. Inputs A and B are corresponding bits of two binary numbers that are to be added. Input C is "carry in". Output X is the sum bit, and output Y is the "carry out" bit.