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CSC137-4 Harvey

HW #2

1.6) What is the biggest positive FP number (in Decimal) that can be represented in 16-bit format using 1-bit sign, 4-bit biased exponent, and 11-bit fraction, where bias is 7?

0 1110 11111111111 → $1110 = (2)^3 + (2)^2 + (2)^1 + (2)^0$

$= 8 + 4 + 2 + 0 = 14$ → bias is $14 - 7 = 7$

frac. bits = 11111111111 → $1.11111111111 = 2^0 + 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + 2^{-5} + 2^{-6} + 2^{-7} + 2^{-8} + 2^{-9} + 2^{-10} + 2^{-10}$

$= 1 + 0.5 + 0.25 + 0.125 + 0.0625 + 0.03125 + 0.015625$

$+ 0.0078125 + 0.00390625 + 0.001953125 + 0.0009765625$

$= 1.99951171875 (2)^7$

$= \boxed{255.9375}$

1.8) Do the following assuming 16-bit FP numbers with 4-bit bias exponent, bias = 7, and 11-bit fraction: What real number does an FP number with sign = 0, bias exponent = 1 and fraction = 0 represent?

0 0001 00000000000 → exp bits 0001 = 1 → bias $1 - 7 = 6$

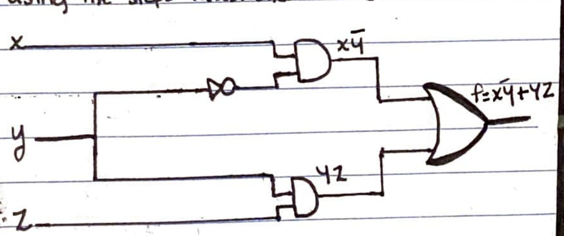
$1(2)^{-6} = \boxed{0.15625}$

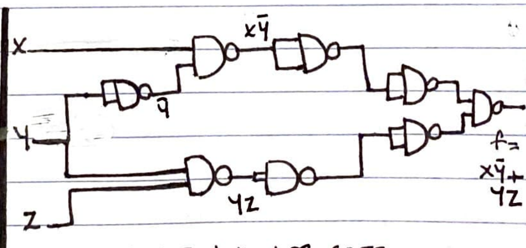
2.4) Proof Demorgan's Theorem $\overline{x+y} = \bar{x}\bar{y}$ by creating truth tables for $f = \overline{x+y}$ and $g = \bar{x}\bar{y}$. Are the two truth tables identical?

x	y	$\bar{x}$	$\bar{y}$	$x+y$	$\overline{x+y}$	$\bar{x}\bar{y}$
0	0	1	1	0	1	1
0	1	1	0	1	0	0
1	0	0	1	1	0	0
1	1	0	0	1	0	0

Yes, using the truth table we can see that $\overline{x+y} = \bar{x}\bar{y}$ which proves they're identical.

2.5) Draw the circuit schematic for $f = x\bar{y} + yz$ and then convert the schematic to NAND gates using the steps illustrated in the textbook.





Converted NOT, AND, & OR GATE to NAND.