HW #2

CSc 137, Harvey

Total (16 pts)

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 offset is 7? **(4 pts)**

0 $\underbrace{1110}$ 11111111111

$\hookrightarrow 1110_2 = 14 - 7$ (bias offset) $= 7$

$\underbrace{1.11111111111}$ $\times 2^7 = (+1.99951171875)_{10} \times 2^7$

$\hookrightarrow 1 \times 2^{-1} + \dots 1 \times 2^{-11} = 0.5 + 0.25 + 0.125 + 0.0625 + 0.03125$
$+ 0.015625 + 0.078125 + 0.00390625$
$+ 0.001953125 + 0.0009765625$
$+ 0.00048828125$

$= 0.99951171875$

1.99951171475×2^7

$= \boxed{255.9375}$

1.8 Do the following assuming 16-bit FP numbers with 4-bit bias exponent, bias offset = 7, and 11-bit fraction: **(4 pts)**

a) What real number does an FP number with sign= 0, bias exponent =1 and fraction = 0 represent? (Answer in 4 decimal places)

exponent $\rightarrow 1_{10} \rightarrow 1_{10} - 7_{10} = -6_{10}$

mantissa $\rightarrow 1.0$

$1.0_2 \times 2^{-6} = 0.000001$

$= 0 + 0 + 0 + 0 + 0 + 0 + (1 \times 2^{-6})$

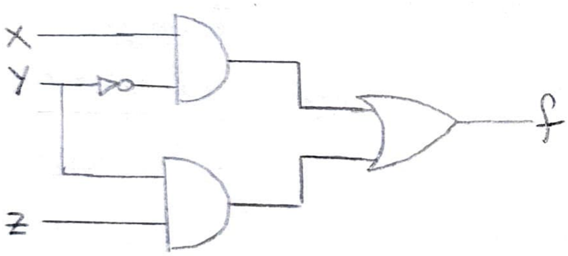
$= 0.015625$

$= \boxed{0.0156}$

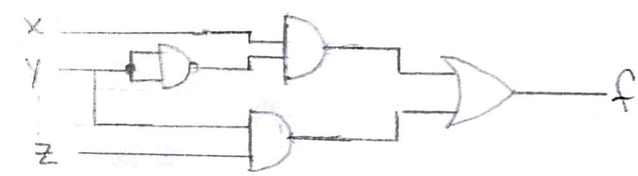
2.4 Proof Demorgan's Theorem $\overline{x+y} = \bar{x}\,\bar{y}$ by creating truth tables for $f = \overline{x+y}$ and $g = \bar{x}\,\bar{y}$. Are the two truth tables identical? **(4 pts)**

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

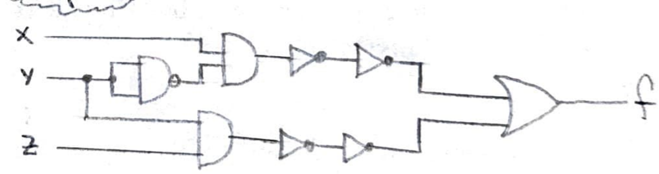
2.5 **(4 pts) Draw the circuit schematic for $f = x\bar{y} + yz$ and then convert the schematic to NAND gates using the steps illustrated in the textbook.**



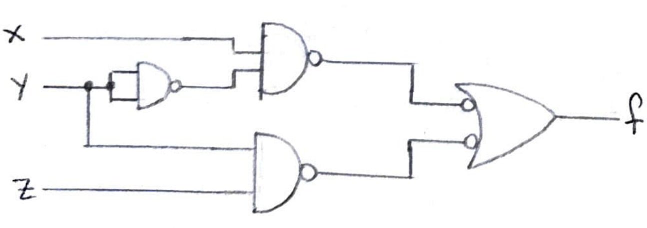
Step 1:



Step 2:



Step 3:



Step 4: