

Name: \_\_\_\_\_

Section: \_\_\_\_\_

Net-ID: Kjecker@wisc.edu

## CS/ECE 252 Introduction to Computer Engineering

Spring 2018

Instructor: Adil Ibrahim

## Homework 3

**Deadline: February 21<sup>nd</sup> 2018**

This Homework covers problems from chapter 2 and chapter 3 of the textbook and is worth 46 points.

For each question below you need to show the complete working to receive full points. Please utilize the space provided under each question. Please upload a PDF version on canvas.

## Problem 1

**(2 pts)**

Convert the following number from binary representation to hexadecimal representation.

Binary Value	Hexadecimal Value
01110010110101110	396AE

## Problem 2

**(6 pts)**

**f**

single: 8 bits

single: 23 bits

double: 11 bits

double: 52 bits

S	Exponent	Fraction
---	----------	----------

(1). What is the most negative number that can be represented by the single precision floating point representation? Give both the floating-point representation and the equivalent decimal number (give answer up to fifth fractional digits).

S	Exponent	Fraction
1	$1111 \ 1110$	$11111111 \dots$

Decimal Value	$-3.4028235 \times 10^{38}$
---------------	-----------------------------

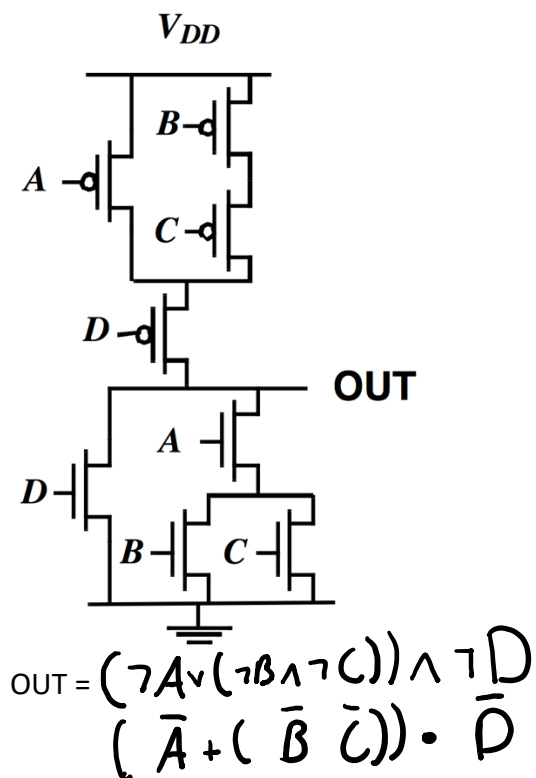
(2). Represent -76.75 with single precision floating point representation.

S	Exponent	Fraction
1	1000 0101	00 1100 1000000000000000

### Problem 3

(6 pts)

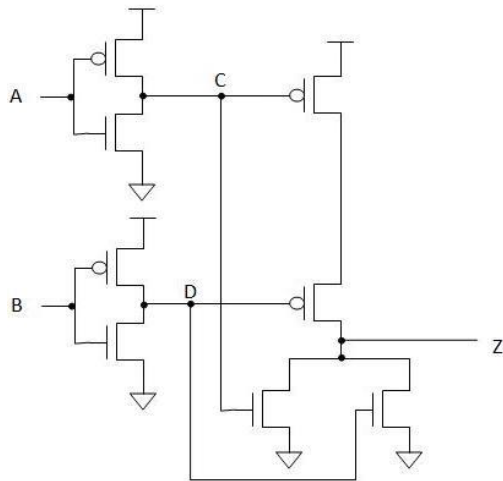
Write down the Boolean expression of OUT in terms of A, B, C, D for the following CMOS circuit:



### Problem 4:

(8 pts)

Finish the truth table for the following CMOS circuit:



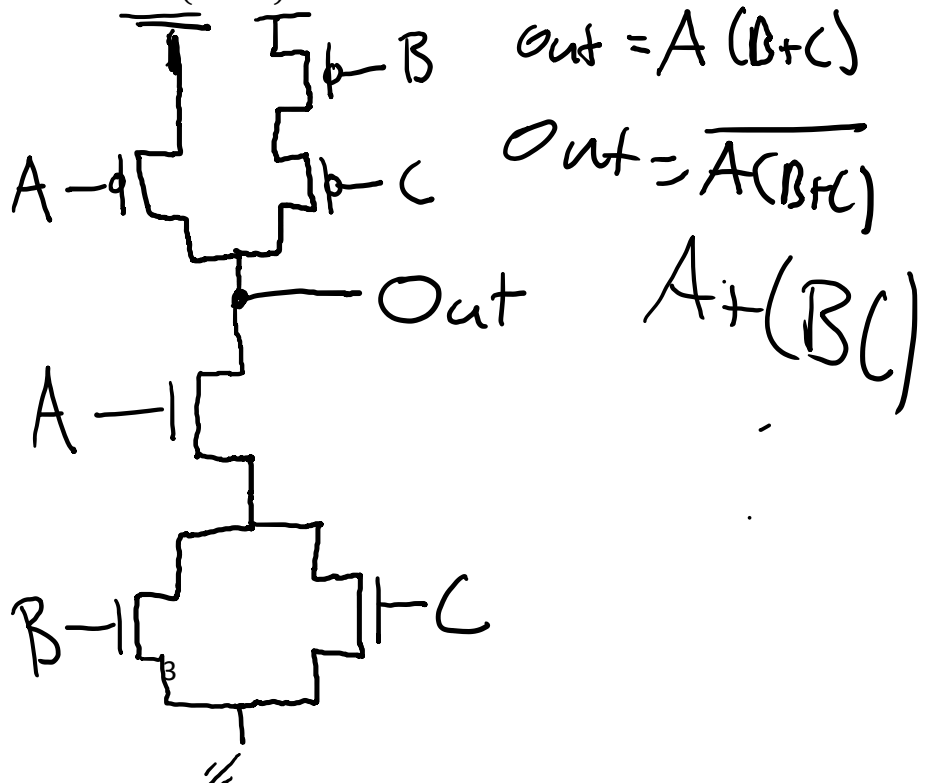
A	B	C	D	Z
0	0	1	1	0
0	1	1	0	0
1	0	0	1	0
1	1	0	0	1

**Problem 5:****(8 pts)**

Draw a 3-input CMOS gate that satisfies the following Boolean expression, and then fill out its truth table:

$$OUT = \overline{A(B+C)}$$

A	B	C	OUT
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0



1	1	0	0
1	1	1	0

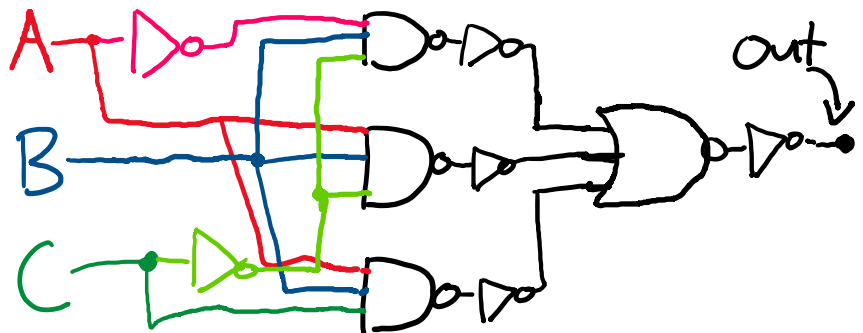
**Problem 6****(8 pts)**

(1). Given the following truth table, express the output Z in terms of A, B, and C.

A	B	C	Z
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

$$Z = (\bar{A}B\bar{C}) + (A\bar{B}\bar{C}) + (ABC)$$

(2). Draw a simplified gate level diagram of the Boolean expression in the last question using NAND, NOR, NOT logic gates.



**Problem 7****(6 pts)**

Simplify the following equation:

$$Z = \overline{\overline{AB}} \cdot \overline{\overline{BC}} + \overline{\overline{AC}}$$

(Hint: use De Morgan's laws.)

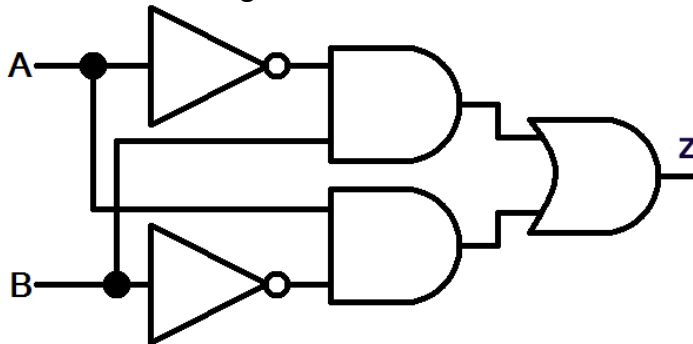
$$\overline{\overline{AB}} \cdot \overline{\overline{BC}} + \overline{\overline{AC}}$$

$$(A+B) \cdot (B+C) + (\bar{A}+C)$$

$$(A+B) + (B+C) \cdot (\bar{A}+C)$$

**Problem 8****(2 pts)**

Given the following circuit:



Express Z in terms of A and B.

$$(\bar{A}B) + (A\bar{B}) = Z$$