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CS/ECE 252 Introduction to Computer Engineering

Fall 2018
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Homework 3
Deadline: October 3rd 2018

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This Homework covers problems from chapter 2 and chapter 3 of the textbook and is worth
32 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 ASCII string "CS252" to its hexadecimal representation. Only represent the
characters within the quotation marks and assume it is null terminated.

$$43 \quad 53 \quad 32 \quad 35 \quad 32_{16}$$

$$|| \quad || \quad || \quad || \quad ||$$
$$C \quad S \quad 2 \quad 5 \quad 2$$

Problem 2 (6 pts)

	single: 8 bits	single: 23 bits
	double: 11 bits	double: 52 bits
S	Exponent	Fraction

(1). What is the most positive 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
0	1111110	11111

Decimal Value	3.4×10^{38}

1

(2). Represent 80.5 with single precision floating point representation.

S	Exponent	Fraction
0	10000101	01000010000...

Problem 3:   (6 pts)

Finish the truth table for the following CMOS circuit:
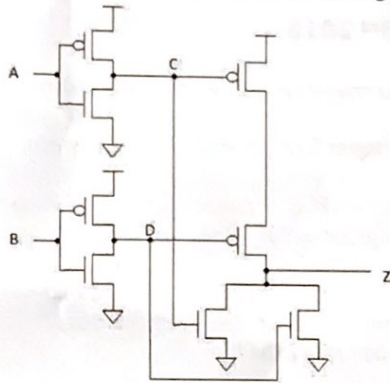
A	B	C	D	Z
0	0	1	1	0
0	1	1	0	0
1	0	0	1	0
1	1	0	0	1

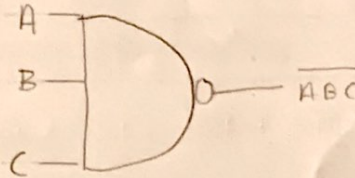## Problem 4:   (8 pts)

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

$$OUT = \overline{ABC}$$

$OUT = \overline{ABC}$

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	1
1	1	0	1
1	1	1	0

A
B —D0— $\overline{ABC}$
C

Problem 5   **(4 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	0
0	1	1	0

1	0	0	1	$\overline{A}\overline{B}\overline{C}$
1	0	1	1	$\overline{A}\overline{B}C$
1	1	0	1	$\overline{A}B\overline{C}$
1	1	1	1	$\overline{A}BC$

$Z = \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}B\overline{C} + \overline{A}BC$

Problem 6   (4 pts)

Simplify the following equation:

$$Z = \overline{\overline{AB} \cdot \overline{BC} + \overline{\overline{A}C}}$$

(Hint: use De Morgan's laws.)

$\overline{\overline{AB}} + \overline{\overline{BC}} \cdot \overline{\overline{\overline{A}C}}$ DeMorgan's Law

$AB + BC \cdot \overline{A}C$ Double negation

$B \cdot (A+C) \cdot \overline{A}C$ Distributive Law (OR)

$B \cdot (A\overline{A}C + C\overline{A}C)$ Distributive Law (OR)

$B \cdot (0C + C\overline{A}C)$ Complement

Problem 7

$B \cdot (0 + C\overline{A}C)$ Annulment (2 pts)

Given the following circuit:

$B \cdot (0 + \overline{A}C)$ Idempotent

$B \cdot \overline{A}C$ Identity

$\overline{A}BC$ Communative
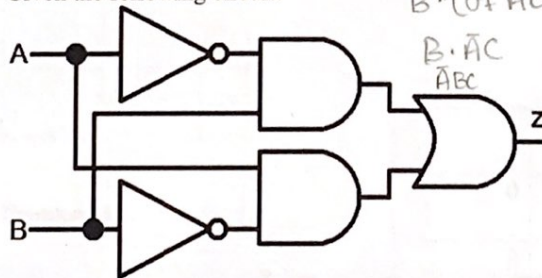
Express Z in terms of A and B.

$A \cdot \overline{B} + \overline{A} \cdot B$