

Student name: \_\_\_\_\_

**Remarks:**

- Exam time: 1:00PM – 1:50PM
- Please write your name at the top-right corner of each page of your exam papers.
- Two pages of cheat sheets are allowed (back and forth).
- You are allowed to leave early. But, please drop your solution along with the exam papers. You don't need to drop your cheat sheet(s).
- GOOD LUCK!

Problem #	1	2	3	4
Total points	10	10	10	20
Student scores				

1. Perform the following operations involving 7-bit 2's complement numbers. Find the decimal values of the resulting 2's complement numbers. Indicate whether arithmetic overflow occurs or not.

$$\begin{array}{r} 1110101 \\ + 1011110 \\ \hline \end{array}$$

$$\begin{array}{r} 0110101 \\ - 1001111 \\ \hline \end{array}$$

2. Find the simplest product-of-sums (~~SOP~~ POS) expression for  $g$ . Show your work.

$$g(a, b, c) = M_0 M_2 M_3 M_4$$

3. Find the simplest sum-of-products (SOP) expression for the function  $F$  whose K-map is shown below, where  $A$ ,  $C$ ,  $W$ , and  $Y$  are the inputs.

Student name: \_\_\_\_\_

WY \ AC		00	01	11	10
	00	0	1	0	0
	01	1	1	0	1
	11	1	0	1	1
	10	1	0	0	0

4. Complete a combinational circuit design using the given Multiplexers and logic gates (if needed) that fulfills the function  $f(x_1, x_2, x_3, x_4) = M_2 M_5 M_7 M_{10} M_{14}$ . Show all your work.

