南方科技大学
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

CS211 Digital Logic (H)

Assignment 2
Due on 23:55, Jul. 20, 2022

Write down your answer to the questions in the given box with **detailed** procedures. For design questions, only drawing the circuit will lead to zero point.

Name: _____ Student ID: _____

Question:	1	2	3	4	5	Total
Points:	10	20	20	20	30	100
Score:						

1. (10 points) Design a four-bit 2's complementer with only OR and XOR gates.

2. (20 points) Design a combinational circuit with three inputs, x, y, and z, and three outputs, A, B, and C. When the binary input is 0, 1, 2, or 3, the binary output is two greater than the input. When the binary input is 4, 5, 6, or 7, the binary output is one less than the input.

3. (20 points) A minority circuit is a combinational circuit whose output is equal to 0 if the input variables have more 1's than 0's. The output is 1 otherwise. Design a 3-input minority circuit by finding the circuit's truth table, Boolean equation, and a logic diagram.

4. (20 points) An 8-to-1 MUX has inputs A, B, and C connected to selection lines S_2, S_1, and S_0, respectively. The data inputs I_0 to I_7 are connected as $I_1 = I_2 = I_7 = 1$, $I_3 = I_5 = 0$, $I_0 = I_4 = D$, and $I_6 = D'$. Determine the Boolean expression of the MUX output.

5. (30 points) Implement the Boolean function $F(A, B, C, D) = \sum(1, 2, 4, 10, 12, 13, 15)$ using
   (a) decoder and external gates, and
   (b) 8-to-1 MUX and external gates.