Digital Logic

CS207 Assignment 2: Theory (Part 1)

Assignment is pledged that you have neither given nor received unauthorized help. All course work should be completed entirely on your own. Students who commit an act of academic dishonesty may receive a zero on the assignment or in the course.

Due on 23:55, Nov. 1, 2022

南方科技大学

SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Assignment Notes

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- Write neatly on A4 papers and submit an e-copy to Sakai on time.
- Do write down all procedures. Only presenting the final answer will lead to a zero, even the answer is correct.
- Do double-check your submitted file. No re-submission is allowed for student reasons, e.g., corrupted file uploaded.
- Box answers when applicable.
- Draw logic diagrams with a pen or any software applicable.
- Turn assignments in early if possible.
- Part 1 of this assignment accounts for 60%, Part 2 the remaining 40%.
- Request to regrade will lead to a complete regrade on all questions in the assignment. Final grades may increase or decrease.

Question 1

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

Question 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, or 2, the binary output is two greater than the input. When the binary input is 3, 4, 5, 6, or 7, the binary output is one less than the input. Draw the logic diagram.

Question 3

- (20 points) A combinational circuit has four inputs A, B, C, and D, and one output Z. The output is 0 if the input combination is a valid BCD coded decimal digit. Otherwise, the output is 1. Draw the logic diagram.

Question 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.

Question 5

- (20 points) Implement the Boolean function $F(A, B, C, D) = \sum(1, 2, 4, 9, 12, 13, 15)$ using
  1. decoder and external gates, and
  2. 8-to-1 MUX and external gates.

  Draw the logic diagram.

Question 6

- (10 points) Using decoders and external gates, design and draw three combinational circuits defined by the following three Boolean functions: $F_1 = x'yz' + xz$, $F_2 = xy'z' + x'y$, $F_3 = x'y'z' + xy$.

Don’t forget that this assignment has a

Part 2: Digital Logic Lab

to complete!