CSE260 Assignment - 3

Deadline - 23rd August, 11:59 PM

Marks: 20

Assignment must be handwritten. Scan and upload PDF in the given google form

Graded Problems

Question 1 (5 Marks)

Build a circuit that converts a 3-bit 2's complement number to its actual 3-bit binary number using encoder(s) and decoder(s).

Question 2: (5 Marks)

Implement the following boolean function using a single 4:1 mux

$F(A,B,C,D) = \sum((0,1,2,4,5,7,11,12,14)$. Use external gates if required.

Question 3: (5 Marks)

Implement the following boolean function using both 3x8 decoder(s) and 2x4 decoder only.

$F(A,B,C,D,E) = \Sigma(0,1,5,15,24,25,27)$. Use external gates if required.

Question 4: (5 Marks)

You want to build a calculator that can add or subtract two 4-bit numbers: X and Y. Now, if X is greater than or equal to 8, and Y is divisible by 12, then the calculator will do the operation X+Y (addition). Otherwise, the calculator will do the operation X-Y(subtraction). **Design** the circuit using a 4-bit parallel adder cum subtractor.

Ungraded Problems (Only for practice, Not required to submit with assignment):

Question 1

Design a 14-person voter counting system using full adders and parallel adders. However, you must implement the full adders using decoders and encoders.

Question 2

Design a half-adder using **a)** NOR gates only. **b)** NAND gates only

Question 3

Design a BCD to Excess-6 code converter encoder(s) and decoder(s).

Question 4

Implement the following Boolean function using both 4:1 and 2:1 mux in a single circuit.

F(A,B,C,D) =∑(0,1,2,7,8,10,11,13, 15). Use external gates if required.

Question 5

Build a circuit that converts a 3-bit 1's complement number to its actual 3-bit binary number using encoder(s) and decoder(s).

Question 6

Design a Full Adder using two 8x1 Mux(s).

Question 7

Design a full adder using **a)** NOR gates only. **b)** NAND gates only

Question 8

Construct a 5x32 Decoder using only 3x8 Decoder(s)

Question 9

Design a 3-bit Parallel Adder using only 8:1 Mux(s)

Question 10

Construct the circuit of 4x2 Priority Encoder. If the number of 1s in the binary input is even, the priority is given to the MSB 1. If the number of 1s inthe binary input is odd, the priority is given to the LSB 1.
Hint: Find the truth table first, then draw the K-map, and finally construct the circuit of the outputs.

Question 11

Consider A is a 4 bit number. Design A-3 (A minus 3) using a 4-bit parallel adder. Use external gates if required. The internal diagram for the parallel adder must be drawn using Encoders and decoders.
NB: Inside the parallel adder, the components you see are basic full adders. For a 4 bit parallel adder, you need 4 full adders. Those full adders must be built using encoder(s) and decoder(s).