# CSE260 Assignment 3

**Question 1 (5 marks):**
Design a circuit diagram for the following system that takes a 4-bit binary number [A] as inputs and outputs in the following fashion:
If A is odd: The output should be A-4
If A is even: The Output should be A+4

**Question 2 (5 marks):**
Design a 10 people attendance system using necessary parallel and half adder(s). Your circuit diagram should be efficient, i.e. use the least amount of components.

**Question 3 (5 marks):**
Design a 13 people voting system using necessary parallel and full adder(s). Your circuit diagram should be efficient, i.e. use the least amount of components.

**Question 4 (10 marks):**
1. Design a BCD to excess 5 system using necessary parallel adder(s).
2. Design an Excess 3 to BCD system using necessary parallel adder(s).

**Question 5 (15 marks):**
Construct the function $F(a,b,c,d) = \sum(0, 2, 6, 8, 12, 14, 15)$:
   a. Using 3x8 decoders and basic logic gates
   b. Using 3x8 decoders and 2x4 decoders (you need to use both in the same circuit)
   c. Using only 2x4 decoders
Your circuit must be efficient, which means you need to use the least amount of components.

**Question 6 (15 marks):**
Construct the function $F(a,b,c,d) = \sum(0, 2, 6, 8, 12, 14, 15)$:
   a. Using 8x1 and 2x1 mux (you need to use both in the same circuit)
   b. Using 4x1 and 2x1 mux (you need to use both in the same circuit)
   c. Using 8x1 and 4x1 mux (you need to use both in the same circuit)
Your circuit must be efficient, which means you need to use the least amount of components.

**Question 7 (10 marks):**
Construct the following functions using a single 4x1 mux:
   a. $F(a,b,c) = \sum(0, 3, 5, 6, 7)$
   b. $F(a,b,c,d) = \sum(0, 3, 5, 6, 7, 9, 11, 13, 15)$

**Question 8 (5 marks):**
Construct the truth table and circuit diagram using 4x2 priority encoder for the following system:
i. If the number of 1 in a binary input is even, then priority will be given to the MSB line.
ii. If the number of 1 in a binary input is odd, then priority will be given to the LSB line.

**Question 9 (5 marks):**
Construct a half adder using 4x2 encoder and 2x4 decoder