

Homework 5

Max marks: 85

Due on Oct 15th, 2021, 9 AM, before class.

Problem 1 Determine the decimal values of the following unsigned numbers ($()_b$ indicates a base b representation) (25 marks):

1. $(0111011110)_2$
2. $(1011100111)_2$
3. $(3751)_8$
4. $(A25F)_{16}$
5. $(F0F0)_{16}$

Problem 2 Determine the decimal values of the following 1's complement binary numbers (15 marks):

1. 0111011110
2. 1011100111
3. 1111111110

Problem 3 Determine the decimal values of the following 2's complement numbers (15 marks):

1. 0111011110
2. 1011100111
3. 1111111110

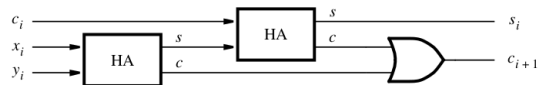
Problem 4 Convert the decimal numbers 73, 1906, -95, and -1630 into signed 12-bit numbers in the following representations (20 marks):

1. Sign and magnitude
2. 1's complement
3. 2's complement

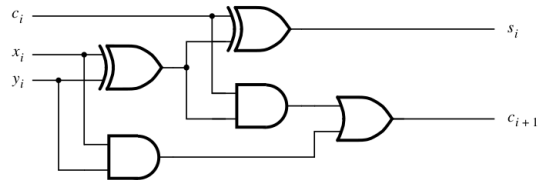
Problem 5 Show that the circuit in Figure 1 implements the full-adder specified in Table 1 (10 marks).

| c_i | x_i | y_i | c_{i+1} | s_i |
|-------|-------|-------|-----------|-------|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 |

Table 1: Truth table for Full adder



(a) Block diagram



(b) Detailed diagram

Figure 1: A decomposed implementation of the full-adder circuit.