

Laboratory 8: Addition and Subtraction

Problem 13:

- a. Perform the following additions using binary numbers:

$$154 + 72, \quad 165 + 199, \quad 123 + 133, \quad 55 + 200$$

Determine the binary result, carry flag C, digital carry flag DC and zero flag Z.

- b. Write a program for the addition of two 8-bit numbers. Show the following output:
- Result (8 bit) at PORTB if button at RA0 is not pressed
 - C flag at RB0, CD flag at RB1, Z flag at RB2 if button at RA0 is pressed.
- c. Simulate your program in MPLAB and use the additions in **a.** as test cases.
- d. Run your program on the test cards for two example additions.

Problem 14:

- a. Perform the following subtractions using binary numbers:

$$73 - 56, \quad 44 - 120, \quad 230 - 142, \quad 87 - 213$$

Determine the binary result, carry flag C, digital carry flag DC and zero flag Z. Explain if there is borrow or not.

- b. Write a program for the subtraction of two 8-bit numbers. Show the following output:
- Result (8 bit) at PORTB if button at RA0 is not pressed
 - C flag at RB0, DC flag at RB1, Z flag at RB2 if button at RA0 is pressed.
- c. Simulate your program in MPLAB and use the subtractions in **a.** as test cases.
- d. Run your program on the test cards for two example subtractions.

Problem 15:

- a. Download the program for the 16-bit addition subroutine from the course webpage. Complete the missing parts (compare to the program in the lecture).
- b. Test your program with the following additions:

$$450 + 2300, \quad 32000 + 46000, \quad 65535 + 432$$

Write down the binary result and the resulting Carry flag.