



Fakulti Komputeran dan Informatik

Assignment #2 (Individual Assignment)

This assignment contributes to the following Course Learning Outcomes:

1. To apply the fundamental concept of computer architecture and organization to solve problems on study cases provided [50 marks (10%)]

1. The followings are 12-bit words read from the memory. Suppose when the words were sent to the memory, the check bits are calculated to be 00000. Using Hamming error correction code, find the new check bit, the syndrome word and the original word stored in the memory for each of the words given below.

a. 0011 0101 1010

(12 marks)

b. 0101 0011 1001

(12 marks)

2. Given $x = -12$ and $y = 5$. Compute the product $p = x \times y$ using 5-bit word and Booth's Algorithm.

(10 marks)

3. Use the Restoring Division Algorithm, as shown in **Figure 1**, to perform division operation of $11 \div 3$ using 4-bit integer representation. Show the Quotient and Remainder.

(12 marks)

Both dividend and divisor are assumed to be positive numbers:

1. Load the two's complement of the divisor into the M register. Load the dividend into the A, Q registers. The dividend must be expressed as a $2n$ -bit positive number.
2. Shift A, Q left 1 bit position.
3. Perform $A \leftarrow A - M$.
4. Choose either one of the followings:
 - a. If the result is nonnegative (most significant bit of A is 0), then set $Q_0 \leftarrow 1$.
 - b. If the result is negative (most significant bit of A is 1), then set $Q_0 \leftarrow 0$, restore the previous value of A.
5. Repeat steps 2 to 4 as many times as there are bit positions in Q.
6. The remainder is in A and the quotient is in Q.

Figure 1

4. **Figure 2** shows the content of a memory and a register; all numbers are decimal. Assume an instruction as shown in **Figure 3**, what is the value of the requested operand if:

- Immediate addressing* is applied? (1 mark)
- Direct addressing* is applied? (1 mark)
- Indirect addressing* is applied? (1 mark)
- Register indirect addressing* is applied? (1 mark)

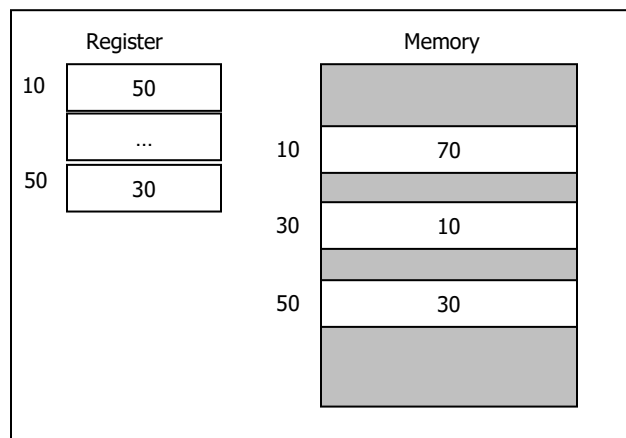


Figure 2

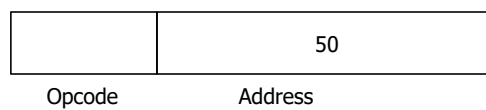


Figure 3

Submission format:

This Assignment 2 is an **Individual Assignment**. You are expected to submit a written report with the following sections:

1. **Introduction.** Briefly describe the purpose of the report. Describes how tasks delegations were conducted in your group and say what each member did. But, each member **must** have contribution for each question.
2. **Answer ALL QUESTIONS**
3. **Conclusion.** Conclude the report with a summary of what you have achieved, challenges faced and how you overcome them.
5. **References.** Provide any references that you used to help you with the assignment.

NOTES:

You must reference the sources used to compile your report, if any. Please choose reputable sources such as library textbooks or journal articles rather than just random websites.

Every word of the report must be your own, except for direct quotes which must be clearly referenced. Copy and paste from the internet or from your fellow students will result in zero marks being awarded to all students involved. Please be aware that copy and paste is *very* obvious. *Please also remember that if you can find someone else's report online then so can I.* Divide the work amongst the group fairly and say what each member did. Clearly show your name and Matric numbers on the report. **Submit the written report online via Smartv3.UMS.**

Deadline: FRIDAY (31/1/2023) before 4.00 pm.