1DT301 – Lab assignment 1

Goal for this lab:

- Learn to write simple programs in LEGv8 Assembly language, using an emulator.
- Manually translate short machine code programs from binary form to LEGv8 Assembly language
- Learn to use the flag registers to implement selection and iteration in assembly code.

Presentation of results:

1) You must submit a report for assignment. The report must be written in LaTeX and follow the requirements found in the template found on Moodle.

2) You must submit a file in *.pdf* format.

3) The file you submit **must be named as follows**: <1DT301_goup_name_assignment1 >. Example: 1DT301_group2_assignment1.pdf.

4) To pass the assignment, you must solve all tasks correctly and write a well-structured report in LaTeX, according to the template. Only submitting code is not enough to pass the assignment!

5) Make sure that all group members names are on the front page in the report! Also, all group members must submit the report under the submission link on Moodle!

Tasks

Task 1:
Download the LEGv8 emulator from the following Github link:

https://github.com/arm-university/Graphical-Micro-Architecture-Simulator

Download the simulator as a .zip file and unzip it.

Open the file LEGv8_Simulator.html, located in the folder: LEGv8_Simulator\war\

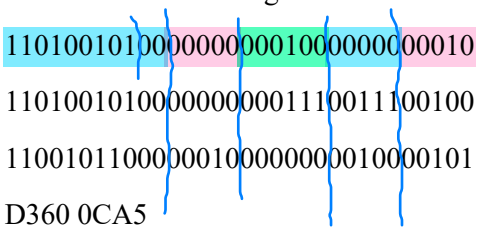
Write the following code in the simulator and run it:

```
MOVZ    x0, #5
MOVZ    x1, #10
ADDI    x1, x1, #2
ADD     x2, x0, x1
```

What number is stored in register X2 after you run the program?

Task 2:

Translate the following machine code instructions to LEGv8 Assembly code:



Task 3:

Create a LEGv8 Assembly program to calculate the value of the following expression:

$$4 \cdot 5 + 16 \cdot 11 + 25$$

When finished, the result shall be stored in register x0.

Note: The Graphical-Micro-Architecture simulator for LEVv8 does not implement the instruction MUL for multiplication, so you have to do the multiplications in another way!

Task 4:

Write a LEGv8 Assembly program to calculate the sum 1 893 423+443 924. The numbers are decimal integers.

You will probably encounter a problem to load these large numbers into registers, so you will have to find a way to solve this problem!

Task 5:

Write a LEGv8 Assembly program to calculate the sum

1 + 3 + 5 +…+ 99.

When finished, the sum shall be stored in register x1.

Task 6:

```
//Set up base memory address
MOVZ        x7, #0x1000, LSL #16

//Store the numbers 1, 4, 1, 5, 9, 2 in dynamic memory
MOVZ        x1, #1
STUR        x1, [x7, #0]
MOVZ        x1, #4
STUR        x1, [x7, #8]
MOVZ        x1, #1
STUR        x1, [x7, #16]
MOVZ        x1, #5
STUR        x1, [x7, #24]
MOVZ        x1, #9
STUR        x1, [x7, #32]
MOVZ        x1, #2
STUR        x1, [x7, #40]
```

Write a loop to add all the numbers stored in memory. When finished, the result shall be stored in register x0.