



Electrical and Computer Engineering

Computer Organization and Microprocessors – ENCS2380

Assembly Assignment

Fall 2021

Deadline: **Monday 16/1/2022**

Instructions:

- It should be an Assembly program, written entirely from scratch by you, satisfying the requirements specified below.
- This assignment is individually work, so every student has to submit his/her own solution and be ready for discussion.
- It is very important that you write easily readable, well-designed, and fully commented code [You must organize your code using procedures].
- No late submission will be accepted.

Assignment:

A - ISBN Checksum Generator

Use Keil uvision software to write and simulate an ARM assembly program that **generates** a valid ISBN checksum for a given ISBN.

B - ISBN Checksum Validator

Use Keil uvision software to write and simulate an ARM assembly program that **checks** the validity of a given ISBN by verifying the checksum

Helping Information

- An ISBN consists of nine digits plus a validation digit.
- The digits are numbered from right to left as d1, d2 ... d10, with d1 being the validation digit.
- You can define the ISBN number in a 10-byte array in the memory. Each digit is stored in a byte.
- To check whether the ISBN is valid or not, the following calculations are performed:

Result = $(10 \times d_{10} + 9 \times d_9 + \dots + i \times d_i + \dots + 2 \times d_2) \% 11$

Calculate $d_1 = 11 - \text{Result}$

If the calculated d1 equal to the d1 in the input ISBN then it is valid

If d1 = 10, it is written 'X'

For example, given the following ISBN:

ISBN = 5123487654

| | | | | | | | | | | |
|--------|-----|----|----|----|----|----|----|----|----|----|
| ISBN = | 5 | 1 | 2 | 3 | 4 | 8 | 7 | 6 | 5 | 4 |
| | d10 | d9 | d8 | d7 | d6 | d5 | d4 | d3 | d2 | d1 |

Result = $x^{10} + x^9 + x^8 + x^7 + x^6 + x^5 + x^4 + x^3 + x^2 \pmod{11}$

= $216 \pmod{11}$

= 7

d1 = $11 - \text{Result}$

= $11 - 7$

= 4

, then the input ISBN is valid, since the calculated d1 is equal to the d1 in the input ISBN.

Some ISBN examples:

The ISBN 5123487654 is valid

The ISBN 5123487658 is not valid

The ISBN 7465159237 is valid

The ISBN 7465159232 is not valid

The ISBN 123456789X is valid

The ISBN 1234567891 is not valid