Exercise 01

Complete the following arithmetic operations in two's complement representation. What are the value of the carry flag and the overflow flag? (Assume a six-bit system)

a) -7 + (-29)
b) 31 + 11
c) 15 - 19
d) -7 x (-3)
e) -7 x (3)
f) 21 / 3
g) 21 / (-3)

Exercise 02

To check for the signed greater or equal (GE) condition, we evaluate whether the negative flag is equal to the overflow flag. If they are equal, then GE condition is true. Explain the reasons why this works.

Exercise 03

For Cortex-M, there are separate division instructions for signed integers and unsigned integers. Does the same division instruction work for both signed and unsigned integers? If yes, prove it. If not, show an example.

Exercise 04

What are the overflow and carry flags in the following operations in a four-bit system?

	Carry	Overflow
1101 + 1100		
1101 - 1100		
1100 + 1010		
0100 - 0110		
0100 + 0010		
0100 + 0110		
1100 - 0110		

Exercise 05

Given the following two 32-bit binary unsigned numbers A and B, find the logic expression of the carry flag when A and B are added. The result is R.

$A = a_{31}a_{30}a_{29} \ldots\ldots a_2a_1a_0$

$B = b_{31}b_{30}b_{29} \ldots\ldots b_2b_1b_0$

$R = r_{31}r_{30}r_{29} \ldots\ldots r_2r_1r_0$

- Find the logic expression of the carry flag when B is subtracted from A.

b) Suppose A and B are signed numbers, find the logic expression of the overflow flag when A and B are added.

- Find the logic expression of the overflow flag when B is subtracted from A.

Exercise 06

Find the address of the last location of on-chip Flash for each of the following, assuming the first location is 0:

(a) ARM with 32 KB
(b) ARM with 8 KB
(c) ARM with 64 KB
(d) ARM with 16 KB
(e) ARM with 128 KB
(f) ARM with 256 KB

Exercise 07

A given ARM has 0x7FFF as the address of the last location of its on-chip ROM. What is the size of on-chip Flash for this ARM?

Exercise 08

Find the on-chip program memory size in K for the ARM chip with the following address ranges:

(a) 0x0000–0x1FFF
(b) 0x0000–0x3FFF
(c) 0x0000–0x7FFF
(d) 0x0000–0xFFFF
(e) 0x0000–0x1FFFF
(f) 0x00000–0x3FFFF