Microprocessors Systems ECSE 426
Quiz 1

Name: Student ID:

Question 1 : Study the following simple assembly code and answer the questions which follow. The startup code calls **asm_tst_function** which in turn is supposed to call **mystery_Function.** **(5 Marks Total)**

	Instruction Address	Part of the startup_stm32f407xx.s file
1		Reset_Handler PROC
2		EXPORT Reset_Handler
3		[WEAK]
4		IMPORT asm_tst_function
5	0x08000188	LDR R0, =asm_tst_function
6	0x0800018A	BLX R0
7	0x0800018D	NOP
8		ENDP

	Instruction Address	ECE426_Quiz.s assembly file
9		**AREA Quiz, CODE, READONLY**
10		***export*** asm_tst_function
11		***export*** mystery_Function
12		; Filling five words in memory with the values
13		; from 1 - 5
14	0x080001CC	**values** DCD 1, 2, 3, 4, 5
15		ALIGN
16		
17		**asm_tst_function**
18	0x080001E0	LDR R0, =values
19	0x080001E2	LDR R1, =mystery_Function
20	0x080001E4	BLX R1
21	0x080001E6	BX LR
22		
23		**mystery_Function**
24	0x080001E8	MOV R3, #4
25	0x080001EC	LDR R4, [R0]
26		**REPEAT**
27	0x080001EE	ADD R0, R0, #4
28	0x080001E0	LDR R5, [R0]
29	0x080001F2	ADD R4, R4, R5
30	0x080001F4	SUBS R3, R3, #1
31	0x080001F6	BNE REPEAT ;BNE: Branch if Not Equal
32	0x080001F8	BX R14
33		**END**

1. When the instruction "BLX R0" at line 6, executes, what is the value of the Link Register (LR or R14)? 0x0800018D **(0.5 Mark)**

2. What does "**mystery_Function"** do? **(1 Mark)**

   Array Summation

3. Suppose that we are to call "**mystery_Function"** from **C,** write the function prototype and function call to do that for the same set of ***values*** (assume values is defined in the C file instead) **(1 Mark)**

Prototype: int **mystery_Function (int myValues[])**
Function call: **mystery_Function (values)**

4. List the changes/code modifications you need to do to the code to accept floating point numbers instead? **(1 Mark)**

   A) Enable the FPU at the beginning of reset handler (0.25 Mark)
   B) Change the following instructions:
   - LDR R4, [R0] → VLDR.f32 S4, [R0] (0.25 Mark)
   - LDR R5, [R0] → VLDR.f32 S5, [R0] (0.25 Mark)
   - ADD, R4, R4, R5 → VADD.f32 → S4, S4, S5 (0.25 Mark)

5. Suppose we need to pass the size of the set ***values*** from C as a second parameter, what changes to the **assembly code** of "**mystery_Function"** are required? Write your modifications here. **(1 Mark)**

   - Delete MOV R3, #4 since the size of the array will be loaded into R1
   - Replace SUBS R3, R3, #1 by SUBS R1, R1, #1

6. How does the code behave when instruction **BX LR** at line 21 executes, and why? **(0.5 Mark)**

   The code will get stuck at line 21, since when the instruction BLX R1 at line 20 was called, it saved the address of BX LR in LR, so now it is always pointing to itself