CS1021 Tutorial 8

Stacks and Subroutines

Q1 If SP = 0x40010000, R4 = 4, R5 =5 and R6 = 6 (1) draw a diagram of the stack after the following instructions are executed and (2) what are the contents of R4, R5, and R6?

(i)
```
PUSH  {R4}
PUSH  {R5}
POP   {R6}
```

(ii)
```
PUSH  {R4, R5}
POP   {R4, R5}
```

(iii)
```
PUSH  {R4, R5}
POP   {R5, R4}
```

(iv)
```
PUSH  {R4, R5, R6}
POP   {R6}
POP   {R5}
POP   {R4}
```

(v)
```
PUSH  {R4, R5, R6}
POP   {R6, R4}
POP   {R5}
```

Q2 If SP = 0x40010000 and R4 = 0, what do the following instructions do?

```
PUSH  {R4}
POP   {PC}
```

Q3 Write suitable entry and exit code for a leaf subroutine XXXX which modifies R4, R5, R6 and R7.

Q4 Write suitable entry and exit code for a non-leaf subroutine YYYY which modifies R4, R5, and R7.

Q5 Write a subroutine STRLEN which returns the length of NUL terminated ASCII string in R0. The address of the string is passed to the subroutine in R0.

Q6 Write a subroutine LEN that computes $\sqrt{x^2 + y^2}$. Assume x is passed to the subroutine in R0, y in R1 and that the result is returned in R0. Assume also that you can call a subroutine SQRT which the returns the integer square root of R0 in R0.

If a is stored @ 0x40000000, b @ 0x40000004 and c @ 0x40000008 respectively, write code, using subroutine LEN, to compute $c = \sqrt{a^2 + b^2}$.