Tutorial 3

Question 1: (7)
Consider the following block of code.
Assume the data labeled `loop` is located at address 0x08000144

```
loop: LDR R0, foo
      LDRB R1, bar
      LDRB R2, qux
      LDRB R3, [R0, R1]
      B loop
      .align
foo:  .word 0x080000FE
bar:  .word 0x6655
qux:  .word foo
norf:
```

a) What is the address of the data labeled `foo`? (2)
b) What is the value of the label `norf`? (1)
c) After block of code has executed, what values do R0, R1, R2 and R3 hold? (4 x 1 = 4)

Question 2: (6)
a) On our microcontroller, how many times can we execute a PUSH instruction before we run out of RAM? Assuming no other RAM usage. (1)
b) If our SP holds address 0x20000100 and we execute a push of a single register, what addresses (all of them) does that register get stored at in memory? (2)
c) Refer to the ARM Architecture v6-M reference manual A6.7.50, subsection 'Operation'. If our SP holds address 0x20000100, and we execute PUSH {R3, R5, R1, R4}, which effective address does each register get stored at? (3)

Question 3: (6)
a) Assuming an ADC operating in 10-bit resolution mode, running off of a 3.1 V supply, what is the resolution of the ADC in volts? (1)
b) For the above configuration, if an input voltage of 0.5 V is applied, what is the value of the output data? (1)
c) For the above configuration, if the output data is 0x1EE, what is the corresponding input voltage range? (1)
d) What is the name of the register which controls the resolution setting of the ADC? (1)
e) Write a sequence of assembly instructions which will set the ADC to output its data in 10-bit, left aligned format. (2)

Bonus: (1)
When an exception occurs, how much is the SP decremented by?

Available marks: 20   Marked out of: 19