

Chapter 3 Homework Questions

- (3.1) Why is the program counter a *pointer* and not a *counter*?

The program counter is used to access memory. The value held in the PC is treated as a memory address rather than an integer value.

- (3.2) Explain the function of the following registers in a CPU: PC, MAR, MBR, IR

- A. PC Program Counter points to the next instruction to be executed
- B. MAR Memory Address Register contains the memory address currently be accessed.
- C. MBR Memory Buffer Register hold data to be written to memory or read from it.
- D. IR Instruction Register holds the fetched, currently executing instruction

- (3.3) For each of the following 6-bit operations, calculate the values of C, Z, V, N

| X | C | Z | V | N |
|---|---|---|---|---|
| A | 0 | 0 | 0 | 0 |
| B | 1 | 1 | 0 | 0 |
| C | 0 | 0 | 0 | 0 |
| D | 1 | 0 | 0 | 0 |
| E | 0 | 0 | 0 | 1 |
| F | 1 | 0 | 0 | 1 |

- (3.10) Why does ARM provide a reverse subtract instruction?

- (3.17) ARM uses 12-bit literal. Compare and contrast the 8-bit format and 4-bit alignment vs straight 12-bit literal.

- (3.18) Write one or more ARM instructions that will clear bits 20 to 25 inclusive in register r0. All other bits of r0 should remain unchanged.

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BIC      r0, r0, #F81FFFFF
```

- (3.19) Swap contents of r0 and r1 without using any other registers or memory storage.

```
EOR      r0, r0, r1
EOR      r1, r0, r1
EOR      r0, r0, r1
```

- (3.25) What is the binary encoding of the following instructions? A. STRB r1, [r2] B. LDR r3, [r4,r5] C. LDR r3,[r4],r5 D. LDR r3, [r4,#-6]

- (3.39) Write ARM assembly that scans a null terminal string and copies the string from a source pointed to by r0 to a destination pointed to by r1

- (3.51) Write ARM assembly that determines whether an odd length string is a palindrome or not. String is ASCII encoded, stored in memory. Pointer to beginning of string in r1, pointer to end of string in r2. On exit, r0 contains 0 if not palindrome, 1 if palindrome.