

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?

To negate a value because ARM does not have an actual negation 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.

```
MOV    r1, #11111100000011111111111111111111
AND    r0, r0, r1
```

- (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 terminated string and copies the string from a source pointed to by r0 to a destination pointed to by r1

```
Loop:
LDR    r2, [r0], #4
STR    r2, [r1], #4
CMP    r2, #0          ; reached null, and stored in memory.
BNE    Loop
```

- (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.