

ARM7/Cortex M3 related Additional Problems

Q2-2 What is the difference between the Harvard and von Neumann architectures?

Q2-3 Answer the following questions about the ARM programming model:

- a) How many general-purpose registers are there?
- b) What is the purpose of the CPSR?
- c) What is the purpose of the Z bit?
- d) Where is the program counter kept?

Q2-4 How would the ARM status word be set after these operations?

- a. $2 - 3$
- b. $-232 + 1 - 1$
- c. $-4 + 5$

Q2-5 What is the meaning of these ARM condition codes?

- a. EQ b. NE c. MI d. VS
- e. GE f. LT

Q2-6 Explain the operation of the BL instruction, including the state of ARM registers before and after its operation.

Q2-7 How do you return from an ARM procedure?

Q2-8 In the following code, show the contents of the ARM function call stack just after each C function has been entered and just after the function exits. Assume that the function call stack is empty when main() begins.

```
int foo(int x1, int x2) {
    return x1 + x2;
}
int baz(int x1) {
    return x1 + 1;
}
int scum(int r) {
    for (i = 0; i < 3; i++)
        foo(r + i, 5);
}
main() {
    scum(3);
    baz(2);
}
```

Q3-1 Why do most computer systems use memory-mapped I/O?

Q3-2 Why do most programs use interrupt-driven I/O over busy/wait?

Q3-3 Write ARM code that tests a register at location ds1 and continues execution only when the register is nonzero.

Q3-4 Write ARM code that waits for the low-order bit of device register ds1 to become 1 and then reads a value from register dd1.

Q3-5 Implement peek() and poke() in assembly language for ARM.

Q3-9 When would you prefer to use busy-wait I/O over interrupt-driven I/O?

Q3-10 If you could only have one of vectors or priorities in your interrupt system, which would you rather have?

Q3-31 What are the stages in an ARM pipeline?

Q3-35 Draw two pipeline diagrams showing what happens when an ARM BZ instruction is taken and not taken, respectively.