

# UNIVERSITY OF DUBLIN

## TRINITY COLLEGE

Faculty of Engineering and Systems Sciences

Department of Computer Science

B.A.(Mod.) Computer Science  
Junior Freshman Examination

Trinity Term 1999

### 1BA3 - Introduction to Computing

Wednesday 2nd June

Sports Hall

14.00 - 17.00

**Dr. Steven Collins**

Attempt **FIVE** questions

(to be accompanied by a 68332 instruction set booklet and  
move instruction template sheet)

1. a) Given the MC68332 move instruction template determine the full machine code (in hexadecimal) for the following instructions (include all required operands). Use the most appropriate encoding in each case:
  - i) `move.w d0,d1`
  - ii) `move.l (a0), $4000`
  - iii) `move.b #$21, $20000`
  - iv) `move.w (a2)+, -(a6)`
- b) Write a short assembly language program that will change the size field of the move instruction located at \$4000 in memory to word size, regardless of its previous contents.
2. a) Define the following terms:
  - i) sign extension
  - ii) sign mantissa encoding
  - iii) condition code register
  - iv) ASCII
- b) Distinguish between carry and overflow and give examples of arithmetic operations that will set each of these flags.
- c) What is the purpose of the X flag and give an example of its use.

3. Design and implement an assembly language program that will sort the 0-terminated list of word-sized values in ascending order. The address of the first element of the list will be supplied as a parameter in `a0`.
4.
  - a) The `bls` instruction implements the condition test `C+Z` (i.e. `C` or `Z`). Demonstrate how this is effectively a less-than-or-same condition when comparing 2 unsigned values.
  - b) Why is it necessary to use signed branch instructions when testing signed numbers? Would it be possible to use the unsigned branches instead?
  - c) Implement the following pseudo-code in assembly language (assuming unsigned values):
 

```

          if( (val1>10 AND val2!=5) OR val3<=0 )
          {
              val4=val4*8;
          }
          
```
5. Give a detailed description of the MC68332 *interrupt handling mechanism*. Your answer should discuss interrupt detection, the interrupt acknowledge cycle, the determination of the appropriate interrupt handler address and the call/return mechanism used to invoke the interrupt handler.
6. Design and implement a program in assembly language that will rotate the value currently being displayed on the 8 LEDs 1 bit at a time every minute. You should use the interrupt processing facilities of the MC68332 and the PIT in your solution.
7.
  - a) Distinguish between address errors and bus errors.
  - b) Show how you would implement (and install) your own illegal instruction handler.
  - c) Why is `rte` a privileged instruction?