

CSC 230: COMPUTER ARCHITECTURE AND ASSEMBLY LANGUAGE

Instructor: Watheq El-Kharashi

Midterm

Fall 2000

Student Name:.....

Registration Number: Lab Section: LF

This is a closed book exam. Time: 50 minutes Total: 40 marks

1) [5 Marks] State whether each of the following statements is true or false:

- The 8-bit two's complement representation of -15_{10} is 11110001_2 . **True**
- 2's complement representation has different representations for $+0$ and -0 . **False**
- The single precision IEEE floating point standard format has different representations for $+0$ and -0 . **True**
- In 2's complement addition, overflow can only occur when adding two negative numbers. **False**
- Single bit parity allows for the detection and correction of single bit errors. **False**

2) [4 Marks] For the single precision IEEE floating point representation for 13.5_{10}

- What is the value of the sign bit: 0
- What is the actual value stored for the exponent (in decimal): 130
- What is the actual value stored for the mantissa (in binary): 1011
(ignore trailing zeros)
- What is the complete 32 bit representation (in hex) of the number: 41580000

3) [3 Marks] How many fetch operations does the 6811 have to perform as it executes each of the following instructions?

- LDAA # \$24 2
- LDAA \$24 3
- LDAA \$24, X 3

4) [10 marks] Consider the following program:

```
P      EQU      6
Q      RMB      1
      ORG      $C000
MAIN   LDAA     #P
      LDAB     #1
LOOP   TSTA
      BEQ      DONE
      ASLB
      DECA
      ; ARITHMETIC SHIFT LEFT ACC B
```

```

        BRA    LOOP
DONE    STAB   Q
        STOP
        END

```

- a) [1 Mark] Circle the correct value that is stored in Q upon reaching the STOP instruction.

$Q = 10^6$ $Q = 2^6$ $Q = 10^{-6}$ $Q = 2^{-6}$ $2*6$

- b) [6 Marks] Show the listing file (.lst) generated by the assembler

```

0001  0006                                P      EQU      6
0002  0000                                Q      RMB      1
0003  c000                                ORG      $C000
0004  c000      86 06                     MAIN    LDAA     #P
0005  c002      c6 01                     LDAB     #1
0006  c004      4d                       LOOP     TSTA
0007  c005      27 04                     BEQ     DONE
0008  c007      58                       ASLB
0009  c008      4a                       DECA
0010  c009      20 f9                     BRA     LOOP
0011  c00b      d7 00                     DONE    STAB     Q
0012  c00d      cf                       STOP
0013  c00e                                END

```

- c) [3 Marks] Show the symbol table generated by the assembler for this program.

```

DONE    C00B
LOOP     C004
MAIN     C000
P        0006
Q        0000

```

- 5) [10 Marks] Perform each of the following operations using 8 bit 2's complement numbers and show the condition code flag settings that will result. As shown all operations are to be done as additions.

Decimal	Answer (show values in binary)	C	V	N	Z
11 – 11	<u>0000 1011</u> + <u>1111 0101</u> = <u>0000 0000</u>	1	0	0	1
-127 – 1	<u>1000 0001</u> + <u>1111 1111</u> = <u>(1) 1000 0000</u>	1	0	1	0

- 6) [8 Marks] Write a complete 6811 assembly language program that sums the even integers from 2 to 26 inclusive leaving the sum in ACCA upon completion of the program.

```

        ORG      $C000
        CLRA
        LDAB     #2
LOOP    ABA
        INCB
        INCB
        CMPB     #26
        BLE      LOOP
        STOP

```

END

End of Midterm