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}

1101.1

1.1011×2^3

- 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_

130

(ignore trailing zeros)

10000010

- What is the complete 32 bit representation (in hex) of the number:_41580000____ 01011 1000 0001

---

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          ; ARITHEMTIC SHIFT LEFT ACC B
        DECA
```

2^6 2^0

1000000

```
        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	_0000 1011_ + _1111 0101_ = _0000 0000_	1	0	0	1
-127– 1	_1000 0001_ + _11111111_ = _(1) 1000 0000_	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