EEAP 282

EXAM #1

September 26, 1997

NAME: _____ CWRUnet ID:_____

IMPORTANT INFORMATION:

1. All questions are worth TEN (10) points apiece. There are NINE questions.
2. Exam is closed book, closed notes. Only the M68000 Programmer's Reference Manual and/or Programming Reference Card are allowed to be used.

Problem	Score
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL SCORE	

Notation used: $ indicates hex, % indicates binary, @ indicates octal.
The following logic functions may be needed at various points throughout the exam.

A	B	A OR B	A AND B	A EOR B
0	0	0	0	0
0	1	1	0	1
1	0	1	0	1
1	1	1	1	0

1. Where are each of the following commands used (vi, UNIX, debugger, etc) and describe their function (a sentence or two):

		where	function
a)	dd		
b)	:wq		
c)	x		
d)	cd ..		

2. Represent -375_{10} in
(a) 16 bit two's complement representation (Give your answer in hex)

(b) 16 bit signed magnitude representation

3. (a) Add the two following 16-bit 2's complement numbers. What is the answer?

$DFEA
$A764

Did signed overflow occur? Yes or No

(b) Add the same two 16-bit numbers which are now unsigned. Does the result change?

$DFEA
$A764

Is there unsigned overflow? Yes or No

4. You bought a new video processor board for your computer. To set it for hardware MPEG you need set the board's firmware. Specifically, you must set bits 3, 4, and 5 of the byte at $14400 to 1,0 and 1 respectively. Furthermore, bit 0 must be set to zero. All other bits must remain unchanged.

Describe how to do this operation with masks. Specify each mask and logical operation that you use. **Give your masks in hex**.

5. Give the memory map (i.e., the contents of memory) corresponding to the following sequence of assembler directives.

```
        ORG     $5000
TABLE1  DC.L    $00609000
        DC.B    $82,12
        DC.L    $9008AB12
        DC.W    $0100,$0090
        DC.L    $FF00
```

Indicate memory contents using the following table.

$5000		
$5002		
$5004		
$5006		
$5008		
$500A		
$500C		
$500E		
$5010		
$5012		
$5014		
$5016		
$5018		
$501A		
$501C		
$501E		

6. Starting at address $6000, memory contains the following sequence of 16-bit values:

```
$D3EE   $01CA   $EEAA   $B00F   $F00D   $3214
```

(a) What is the hex value of the byte contents of address $6005?

(b) What is the hex value of the long word contents of address $6006?

7. That crazy CWRU professor who designs all the strange processors is back. He has designed a new, specialized processor based upon a 0.35μm CMOS process which has an 8-bit data bus and a 24 bit address bus. The processor operates at 64 MHz and is interfaced to a 16 bit A/D converter which looks like a 16-bits of memory at $88000. Assume that the processor can perform a complete read/write in one clock cycle.

(a) What is the range of memory address (in hex) that this microprocessor can access?

(b) What is the maximum number of bytes of memory this machine can have? Be exact.

8. What is the instruction(s) performed by the following machine code in memory? Express your answer in hex. Hint: You need only consider instructions of the form MOVE, ADD, SUB, ADDI or MOVE.

address	word		
$8000	$3039		
$8002	$0030		
$8004	$0330		
$8006	$0485	SUBI.L	#$00209834,D5
$8008	$0020		
$800A	$9834		

Machine code	assembly language	
0443 <number>	SUBI.W	#N,D3
0479 <number>,<long address>	SUBI.W	#N,<long address>
0478 <number>,<word address>	SUBI.W	#N,<word address>
9679<long address>	SUB.W	<long address>,D3
9678<word address>	SUB.W	<word address>,D3
9779 <long address>	SUB.W	D3,<long address>
9778 <word address>	SUB.W	D3,<word address>
0643 <number>	ADDI.W	#N,D3
0679 <number>,<long address>	ADDI.W	#N,<long address>
0678 <number>,<word address>	ADDI.W	#N,<word address>
D678 <word address>	ADD.W	<word address>,D3
D778 <word address>	ADD.W	D3,<word address>
D679 <long address>	ADD.W	<long address>,D3
D779 <long address>	ADD.W	D3,<long address>
363C <number>	MOVE.W	#N,D3
33FC <number>,<long address>	MOVE.W	#N,<long address>
3639 <long word>	MOVE.W	<long address>,D3
31C3 <word address>	MOVE.W	D3,<word address>
33C3 <long address>	MOVE.W	D3,<long address>
4EB9 <address>	BRA	<address>
4EF9 <address>	JMP	<address>

9. Using the table given above, decode the machine instructions shown below i.e. what is the assembly equivalent of the machine code?

Address	Machine Code
$9000	$3639
$9002	$0000
$9004	$9502
$9006	$D678
$9008	$9504
$900A	$33C3
$900C	$0000
$900E	$9010
$9010	$0443
$9012	$9500
$9014	$0000
$9016	$0000
. . .	
$9500	$0600
$9502	$3000
$9504	$01C3