

COE538 Midterm Study Guide (2010)

About this study guide

The study guide covers many of the topics you should understand in preparation for the midterm. However, it is not comprehensive and should be viewed as minimal preparation. In particular, the midterm will not contain any of these questions and could contain questions covering topics not included in the study guide.

How to use the guide

The guide consists of questions and answers. Each question also indicates the estimated maximum time it should take you to answer the question. It is recommended that you try to answer the question before looking at the answer.

Textbook sections

Chapters 1—5

The Questions and Answers

Q1) (20 minutes)

What is the contents of the memory location \$5000 following the execution of the following program starting with the instruction at address \$6000?

```
result    org $5000
          rmb 1

          org $6000
          ldx #vector
          ldaa #8
          jsr foo
          stab result
          swi

foo       psha
          clrb

loop     addb 1,x+
          deca
```

	bne loop
div	pula lsra beq done lsrb bra div
done	rts
vector	fcv 3,5,1,7,2,4,1,1

Answer: 3 foo calculates the average of n numbers assuming n is a power of 2.

Q2) (20 minutes) Complete the following table by filling in the Location, Contents, Instruction and Operand columns so that the resulting code corresponds to the Comments column. (Note: to perform the “hand assembly”, you need to refer to Appendix A of the CPU manual.)

Location (hex)	Contents	Label	Instruction	Operand	Comments
			org	\$6000	Set next location to 0x6000
6000	86 05		ldaa	#5	Make AccA have value 5
6002			adda	\$6001	Add to AccA contents of 0x6001
					Make AccB = contents of memory location \$6004
					Make Acc D = AccA * AccB
					Compare AccA with contents of address \$5000 (AccA contains an unsigned integer)
					Go to “done” if AccA was the bigger number
					Subtract 5 from Accumulator A
		done			swi

Answer:

Location (hex)	Contents	Label	Instruction	Operand	Comments
			org	\$6000	Set next location to 0x6000
6000	86 05		ldaa	#5	Make AccA have value 5
6002	BB 60 01		adda	\$6001	Add to AccA contents of 0x6001
6005	F6 60 04		ldab	\$6004	Make AccB = contents of memory location \$6004
6008	12		mul		Make Acc D = AccA * AccB
6009	B1 50 00		cmpa	\$5000	Compare AccA with contents of address \$5000 (AccA contains an unsigned integer)
600C	22 02		bhi	done	Go to "done" if AccA was the bigger number
600E	80 05		suba	#5	Subtract 5 from Accumulator A
6010	3F	done			swi

Q3) (20 minutes) Write a subroutine called foo that takes two parameters passed on the stack where it is known that the first parameter (called p) is bigger than the second parameter (called q), computes $(p-q)q$ by repeated addition and returns the result in AccA. Assume that all variables are 8 bit unsigned integers and that the result does fit into 8 bits (i.e. no error or overflow checking is required). The code below illustrates the algorithm to use. (Note: you may use registers or stack allocated local variables for the variables i and r in the C version.)

```
unsigned char foo(unsigned char p, unsigned char q) {
    unsigned char i;
    unsigned char r = 0;
    for(i = p - q; i != 0; i--) {
        r += q;
    }
}
```

```
    }  
    return r;  
}
```

Answer:

```
p equ 2  
q equ 3
```

```
foo    clrb  
       ldaa p,s  
       suba q,s
```

```
loop   beq done  
cont   addb q,s  
       deca  
       bne cont  
       rts
```