

ARIZONA STATE UNIVERSITY
DEPARTMENT OF ELECTRICAL ENGINEERING

EEE 404/591 Spring 2009
Problem Set #4

Assigned: 1 April 2009

Due Date: 15 April 2009

Reading: Finish reading Section 1.7 (pages 29 to 38). Read Sections 4.1 (pages 154 to 158), Section 4.4 (pages 202 to 228), and Section 4.6 (pages 246 to 255) of the Kuo and Gan book. Read Chapters 1, 2, 3 and 6 of the *TMS320C55x DSP CPU Reference Guide*. Start reading Chapter 8 of the Kuo and Gan book.

PROBLEM 4.1:

Perform Part B “TMS320C5510 Assembly Tutorial” of Lab 8 (pages 10 to 24) and submit your answers to the questions in Part B.

PROBLEM 4.2:

- (a) Provide a memory-map table showing how the following data values are stored in the TMS320C5510 32-bit wide data/program memory:

Data Value	Data Address
0011FFEEh	010103h
low_byte(0003h)	hi_byte(010100h)
17F8h	010101h
3344311Eh	010106h

- (b) Consider the following instruction:

MOV dbl*(#010107h), AC1

- Indicate the data bus address generated for this instruction.
- Considering the data values stored in memory as in (a), indicate the value of AC1 after this instruction is executed.

PROBLEM 4.3:

Let $x = 0101000$ and $y = 0110$ be two fractional 2's complement binary numbers in Q6 and Q3 formats, respectively. Compute the division x/y using the sequential division algorithm. Show the performed steps and determine the resulting quotient and remainder.

PROBLEM 4.4:

Consider a TMS320C5510 with hexadecimal data values stored in accumulators AC0 and AC1, extended auxiliary registers XAR0 and XAR1, extended data-page register XDP, and locations 0100h to 0107h of the main data pages 0 and 1, as shown below. Also, let the status bit M40 be equal to 1 (accumulators treated as 40 bits), and let the status bit SXMD be equal to 1 (values are sign extended instead of being zero extended). In addition, the CPL status bit is cleared indicating that the DP direct addressing mode is selected instead of the SP direct addressing mode.

AC0:

0	0	0	0	3	2	5	A	1	D
---	---	---	---	---	---	---	---	---	---

AC1:

F	F	F	F	F	6	8	3	9	0
---	---	---	---	---	---	---	---	---	---

XAR0:

0	0	0	1	0	2
---	---	---	---	---	---

XAR1:

0	1	0	1	0	3
---	---	---	---	---	---

XDP:

0	1	0	1	0	4
---	---	---	---	---	---

XCDP:

0	0	0	1	0	0
---	---	---	---	---	---

Data Page 0:	0100h-0101h	0 2 3 1 2 A 8 0
	0102h-0103h	7 0 2 1 4 3 1 5
	0104h-0105h	0 0 5 6 1 4 1 3
	0106h-0107h	1 1 0 2 5 4 6 4

Data Page 1:	0100h-0101h	0 0 7 F 2 1 1 7
	0102h-0103h	2 2 6 0 5 5 7 B
	0104h-0105h	F F 3 0 6 1 0 1
	0106h-0107h	5 E 7 0 1 2 0 2

For each of the following instructions, indicate the addressing mode used, and which address buses (BAB, CAB, DAB, EAB, or FAB) and data buses (BB, CB, DB, EB, or FB) are used, and answer the corresponding questions.

Note: for each instruction, start with the initial values given above.

(a) MOV *+AR1, AC0

- Addressing Mode (Circle One):

Immediate k16 absolute k23 absolute DP direct Register bit-direct
 AR indirect Dual AR indirect CDP indirect Coefficient indirect

- Address Busses used (Circle All that Apply):

BAB CAB DAB EAB FAB None

- Data Busses used (Circle All that Apply):

BB CB DB EB FB None

- Determine the values stored in AR1 and AC0 after this instruction is executed.

(b) MOV #-10, AC0

- Addressing Mode (Circle One):

Immediate k16 absolute k23 absolute DP direct Register bit-direct
AR indirect Dual AR indirect CDP indirect Coefficient indirect

- Address Busses used (Circle All that Apply):

BAB CAB DAB EAB FAB None

- Data Busses used (Circle All that Apply):

BB CB DB EB FB None

- Determine the value stored in AC0 after this instruction is executed.

(c) (2 points) MOV mmap(@AR0), AC1

- Addressing Mode (Circle One):

Immediate k16 absolute k23 absolute DP direct Register bit-direct
AR indirect Dual AR indirect CDP indirect Coefficient indirect

- Address Busses used (Circle All that Apply):

BAB CAB DAB EAB FAB None

- Data Busses used (Circle All that Apply):

BB CB DB EB FB None

- Determine the values stored in AR0 and AC1 after this instruction is executed.

(d) MOV AC1, dbl(*AR1)

- Addressing Mode (Circle One):

Immediate k16 absolute k23 absolute DP direct Register bit-direct
AR indirect Dual AR indirect CDP indirect Coefficient indirect

- Address Busses used (Circle All that Apply):

BAB CAB DAB EAB FAB None

- Data Busses used (Circle All that Apply):

BB CB DB EB FB None

- Determine the values stored in AR1, AC1, and any modified memory locations (address and stored values) after this instruction is executed.

(e) BCLR @9, AC0

- Addressing Mode (Circle One):

Immediate k16 absolute k23 absolute DP direct Register bit-direct
AR indirect Dual AR indirect CDP indirect Coefficient indirect

- Address Busses used (Circle All that Apply):

BAB CAB DAB EAB FAB None

- Data Busses used (Circle All that Apply):

BB CB DB EB FB None

- Determine the value stored in AC0 after this instruction is executed.