CPE/EE 323 Introduction to Embedded Computer Systems Homework II

1(25)	2(40)	3(35)	Total

Problem #1 (25 points) Consider the following assembly directives (see below). Show the content of relevant region of memory initialized by these directives. MSP430 is a little-endian architecture. Fill in the table below.

ORG 0xF000 ; allocates a byte in memory and initialize it with 5 b1: DB 5 b2: DB -122 b3: DB 10110111b ; binary value of a constant b4: DB 0xA0; octal value of a constant b5: 123q DΒ EVEN EQU 25 tf DW w1:32330 w2: DW -32000 dw1: DL -100000 ; Allocates a long word size constant in memory dw2: DL tf ; Allocates 4 bytes in memory with string ABCD s1: DB 'ABCD' ; Allocates 5 bytes in memory s2: DB "abcd"

Label	Address [hex]	Memory[7:0] [hex]
b1	0xF000	0x05
b2	0xF001	0x86
<u> </u>		

Problem #2 (40 points) Consider the following instructions given in the table below. For each instruction determine its length (in words), the instruction words (in hexadecimal), source operand addressing mode, and the content of register R7 after execution of each instruction. Fill in the empty cells in the table. The initial content of memory is given below. Initial value of registers R5, R6, and R7 is as follows: R5=0xF000, R6=0xF008, R7=0xFFFF. Assume the starting conditions are the same for each question (i.e., always start from initial conditions in memory) and given register values.

	Instr.	Instruction	Instr.	Instruction Word(s)	Source Operand	R7=?
	Address		Length	[hex]	Addressing	[HEX]
			[words]		Mode	
(i)	0x1116	MOV R5, R7	1	0x4507	Register	0xF000
(ii)	0x1116	MOV.B R5, R7	1	0x4447	Register	0x0000
(a)	0x1116	MOV 4(R5), R7				
(b)	0x1116	MOV.B 3(R5), R7				
(c)	0x1116	MOV.B -3(R6), R7				
(d)	0x1116	MOV TONI, R7				
(e)	0x1116	MOV.B EDE, R7				
(f)	0x1116	MOV &EDE, R7				
(g)	0x1116	MOV.B @R5, R7				
(h)	0x1116	MOV @R5+, R7				
(i)	0x1116	MOV #45, R7				
(j)	0x1116	MOV.B #45, R7				

Label	Address [hex]	Memory[15:0] [hex]		
	0xF000	0x0504		
	0xF002	0xFFEE		
TONI	0xF004	0x0203		
	0xF006	0x3304		
	0xF008	0xF014		
	0xF00A	0x2244		
EDE	0xF00C	0xCDDA		
	0xF00E	0xEFDD		

Problem #3 (35 points) Consider the following instructions given in the table below. For each instruction determine changes in registers after its execution. Fill in the empty cells in the table. Initial value of registers R2, R5, and R7 is as follows: R2=0x0007, R5=0xAA55, R7=0x1357. Assume the starting conditions are the same for each question (i.e., always start from the initial conditions in registers).

Instruction		R7=0x????	V	N	Z	C
ADD.B	R5, R7	0x00AC	1	1	0	0
ADD	R5, R7					
ADDC	R5, R7					
SUB.B	R5, R7					
SUBC	R5, R7					
CMP.B	R5, R7					
CMP	R5, R7					
BIT	R5, R7					
BIC	R5, R7					
BIS	R5, R7					
AND	R5, R7					
XOR.B	R5, R7					
SWB	R7					
RRC.B	R7					
RRC	R7					
RRA.B	R7					
RRA	R7					