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Homework 6

1. Assume that the content of all registers (0 through 31) is 0x0 before executing the below code. Show the contents of relevant registers (only the registers whose contents are modified) after the execution of each instruction in the below MIPS code. [10]

<u>INSTRUCTIONS</u>	<u>What's happening</u>	<u>What is in the registers</u>
addi \$s0, \$zero, 0xF0	$\$s0 = 0 + 0xF0$	$\$s0 = 0xF0$
sll \$t0, \$s0, 2	$\$t0 = 0xF0 * 4 = 0x3C0$	$\$t0 = 0x3C0$
addi \$s1, \$zero, 0xAB	$\$s1 = 0 + 0xAB$	$\$s1 = 0xAB$
srl \$s1, \$s1, 2	$\$s1 = 0xAB // 4 = 0x2A$	$\$s1 = 0x2A$
add \$s2, \$t0, \$s1	$\$s2 = 0x3C0 + 0x2A = 0x3EA$	$\$s2 = 0x3EA$

WORK

<p>HW #6</p> <p> $0xF0 \rightarrow 1111/0000$ $0xF0 \times 4 \rightarrow 11/1100/0000$ $\rightarrow 0011/1100/0000 = 3C0_{16}$ </p>		
#1	addi \$s0, \$zero, 0xF0	$\# \$s0 = 0 + 0xF0$ $\# \$s0 = 0xF0$
	sll \$t0, \$s0, 2	$\# \$t0 = \$s0 \times 4$ $\# \$t0 = 0x3C0$
	addi \$s1, \$zero, 0xAB	$\# \$s1 = 0 + 0xAB$ $\# \$s1 = 0xAB$
	srl \$s1, \$s1, 2	$\# \$s1 = \$s1 // 4$ $\# \$s1 = 0x2A$
	add \$s2, \$t0, \$s1	$\# \$s2 = 3C0 + 2A$ $\# \$s2 = 3EA$
		$0xAB = 1010\ 1011$ $0xAB \rightarrow 0010\ 1010$ $= 2A$

2. Write the MIPS code for the python statement, $A[j] = k - (3 * A[i] - 10)$. Assume that register \$t0 has base address of A, variable j, k, i are in \$s0, \$s1, \$s2 respectively. A is a word size array. [15]

#2 $A[j] = k - (3 * A[i] - 10)$

\$t0 → base addr of A word size array

\$s0 → j

\$s1 → k

\$s2 → i

$$\begin{array}{ll}
 \text{Sll } \$s2, \$s2, 2 & \# \$s2 \times 4 \rightarrow \$s2 \\
 \text{add } \$t1, \$t0, \$s2 & \# \$t0 + \$s2 \rightarrow \$t1 \rightarrow \text{addr of } A[i] \\
 \text{lw } \$s3, 0(\$t1) & \# A[i] \rightarrow \$s3 \\
 \text{Sll } \$s4, \$s3, 1 & \# A[i] \times 2 \rightarrow \$s4 \\
 \text{add } \$s4, \$s4, \$s3 & \# (A[i] \times 2) + A[i] \rightarrow \$s4 \\
 \text{addi } \$s4, \$s4, -10 & \# (A[i] \times 3) - 10 \rightarrow \$s4 \\
 \text{sub } \$s1, \$s1, \$s4 & \# k - (A[i] \times 3) - 10 \rightarrow \$s1 \quad * \\
 \text{Sll } \$s0, \$s0, 2 & \# \$s0 \times 4 \rightarrow \$s0 \\
 \text{add } \$t2, \$t0, \$s0 & \# \$t0 + \$s0 \rightarrow \$t2 \rightarrow \text{addr of } A[j] \\
 \text{sw } \$s1, 0(\$t2) & \# \text{store } \$s1 = k - ((3 \times A[i]) - 10) \text{ into } A[j]
 \end{array}$$