Computer Architecture Lab – CS322

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Lab 10 – Study of MIPS, Single/Multi-Cycle/Pipelined Processor Architecture

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Task 1:

Given Program and its Machine Code

Labels	Instruction	Machine Code
	add $s0, $0, $0	00008020
	add $s1, $0, $0	00008820
	addi $t0, $0, 10	2008000A
loop:		
	slt $t1, $s0, $t0	0208482A
	beq $t1, $0, done	11200003
	add $s1, $s1, $s0	02308820
	addi $s0, $s0, 1	22100001
	j loop	08000003
done:		

Registers before execution:

$t0	$s0	$s1
0	0	0

Registers after execution:

$t0	$s0	$s1
10	10	45

Task 2:

Number of Cycles in Single Cycle Architecture = 55

Number of Cycles in Multi-Cycle Architecture = 199

Number of Cycles in Pipelined Architecture = 128

$$\text{Cycles per Instruction (CPI)} = \frac{\text{Total program execution cycles}}{\text{Number of Instructions executed}}$$

Total Number of instructions executed is 55.

$$\text{For Single Cycle Architecture, CPI} = \frac{55}{55} = 1$$

$$\text{For Multi-Cycle Architecture, CPI} = \frac{199}{55} = 3.62$$

$$\text{For Pipelined Architecture, CPI} = \frac{128}{55} = 2.33$$

Given Program and its Machine Code

Labels	Instruction	Execution Count
	add $s0, $0, $0	1
	add $s1, $0, $0	1
	addi $t0, $0, 10	1
loop:		
	slt $t1, $s0, $t0	11
	beq $t1, $0, done	11
	add $s1, $s1, $s0	10
	addi $s0, $s0, 1	10
	j loop	10
done:		
Total number of Instructions executed		55