

EE3755

Homework 6 Due: TBA

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Estimated time to finish:

Prob.1 : 10Mins.

Prob.2 : 10Mins.

Prob.3: 30Mins.

Total 50 Mins.

Read below and answer problem 1.

Pipe Lined Machine.

Similar to Fig 5.42(Class Notes : MIPS DATA PATH DESIGN HTML Notes) (but every instruction has same number of state.

Execution of each state takes same clock cycle (1 clock cycle).

For example: MIPS.

Every instruction has these five states.

IF ID EX MEM WB.(refer to the class note for the functionality)

The beauty of this machine is overlapping of execution of instructions.

For Example.

And \$1,\$2,\$3

Or \$4,\$5,\$6

Add \$7,\$8,\$9

Sub \$10,\$11,\$12.

Case1) if every instruction takes 5ns.

It needs 4(instructions)* 5(ns)(=20ns) to finish above 4 instructions without overlapping of executions.

Case2) if each stage takes 1ns then every instruction still takes 5 ns(5 stages for each instruction) to finish.

But the overall time to finish those 4 instructions is shorter than case 1.

				time							
				1	2	3	4	5	6	7	8
and	\$1	\$2	\$3	IF	ID	EX	MEM	WB			
or	\$4	\$5	\$6		IF	ID	EX	MEM	WB		
add	\$7	\$8	\$9			IF	ID	EX	MEM	WB	
sub	\$10	\$11	\$12				IF	ID	EX	MEM	WB

(Case 2. **although each instruction takes 5ns, overall execution time is only 8 ns**)

Problem 1. Because of some difficulties, not every instruction can be overlapped just like above.

But let's assume we can overlap every instruction .

1- 1. How much time will it take to finish 1 million instructions at case 1(without overlapping).(simple math.).

1- 2. How much time will it take to finish 1 million instructions at case 2(with overlapping)

(Hint: a little bit longer than 1million ns)

Problem 2. Answer the questions without looking anything.(you may look after answer these and correct the answers)

For MIPS instructions.

LOOP:

```
0x400000    add    r1,r2,r3
            addi   r1, r2,0x20
            beq    r0,r0, LOOP
```

2-1)Write Machine code for the first 2 instructions(add r1,r2,r3).

(Hexadecimal format)

Hint :

opcode for add is 0 and func field is 0x20.

opcode for addi is 8 and think about rt and rs fields.

2-2) when the third instruction is converted to machine code,

what will be the value for "LOOP"

Problem 3. Using MIPS simulator, Write this very simple program.

MIPS program to print "EE3755"

and Exit from the program(**Copy the text from the screen and submit with program**)