

0907432 Computer Design (Spring 2010)

Quiz 1A

رقم الشعبة:

رقم التسجيل:

الاسم:

Instructions: Time 15 minutes. Closed books and notes. No calculators. Please answer all problems in the space provided. No questions are allowed.

<Good Luck>

Q1. Consider the following data:

Processor	Clock rate	No. instructions	Time
P1	2.0 GHz	20×10^9	7 s
P2	1.5 GHz	30×10^9	10 s

Find the clock rate for P2 that reduces its execution time to that of P1.

$$\text{Time}_{\text{new}}/\text{Time}_{\text{old}} = 7/10 = 0.7$$

$$\text{So } f_{\text{new}} = f_{\text{old}}/0.7 = 1.5 \text{ GHz}/0.7 = 2.14 \text{ GHz.}$$

Q2. Find all data dependencies in the following instruction sequence. For every data dependence, identify its type, the instructions involved, and the dependence location.

I1: lw \$1, 40(\$2)

I2: add \$2, \$3, \$3

I3: add \$1, \$1, \$2

I4: sw \$1, 20(\$2)

RAW:

(\$1) I1 to I3

(\$2) I2 to I3, I4

(\$1) I3 to I4

WAR:

(\$2) I1 to I2

WAW:

(\$1) I1 to I3

Q3. A traditional VLIW processor accepts long instructions that have the following five fields:

Branch	ALU	ALU	Memory	Memory
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Show the best schedule for the following operations into such 5-operation instructions. Assume that the processor has full forwarding paths, branch and ALU instructions are executed in one cycle, and memory instructions are executed in two cycles.

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lw    r1, 0(r2)
lw    r3, 4(r2)
add   r1, r1, r3
sw    r1, 8(r2)
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Branch	ALU	ALU	Memory	Memory
nop	nop	nop	lw	lw
nop	nop	nop	nop	nop
nop	add	nop	nop	nop
nop	nop	nop	sw	nop