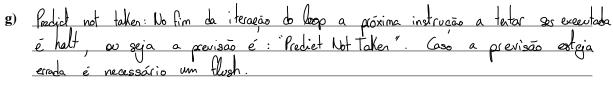
STUDENTS IDENTIFICATION:

Number:	Name:
106059	Lora Alexandra Comes de Faria
10 6171	Guilherne Vaz Rocha
106922	Leoner Nunes de Miranda Congalves Francisco

2.1 Simple execution, without data forwarding techniques

f)	Clock cycles	377
	Instructions	166
	Average CPI	2,271

Stalls: - Data	192
- Structural	0
- Branch Taken	15



e) 1.5

2.2 Application of data forwarding techniques

c)	Clock cycles	297
	Instructions	166
	Average CPI	1,789

Stalls: - Data	112
- Structural	IG.
- Branch Taken	(5

 $speadup = \frac{377}{297}$ 1, 2 6 9 3 6

2.3 Source code optimization: minimization of data and structural hazards

a) Attach a copy of the new assembly program.

c)	Clock cycles	249
	Instructions	166
	Average CPI	1,500

Stalls: - Data	48
- Structural	16
- Branch Taken	15

speedup = 377 : 1,5140562

2.4 Source code optimization: loop unrolling

a) Attach a copy of the new assembly program.

c)	Clock cycles	153
	Instructions	126
	Average CPI	1.214

Stalls: - Data	0
- Structural	16
- Branch Taken	7

2.5 Source code optimization: branch delay slot

a) Attach a copy of the new assembly program.

d)	Clock cycles	134
	Instructions	166
	Average CPI	1,4(0

Stalls: - Data	48
- Structural	16
- Branch Taken	0

e)
$$speedup = \frac{377}{237} = 1,6(1)$$

Table 1: Pipeline time diagram, without data forwarding techniques.

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Table 2: Pipeline time diagram, with data forwarding techniques.

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Table 3: Pipeline time diagram, with minimization techniques to reduce the data and structural hazards.

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Table 4: Pipeline time diagram: usage of loop unrolling minimization techniques to reduce the control hazards.

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Table 5: Pipeline time diagram: usage of branch delay slot techniques to reduce the control hazards.

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