

*In The Name of God*

# Computer Architecture Homework 2

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February 24, 2015

powered by L<sup>A</sup>T<sub>E</sub>X

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## 1 Problem 1

Instruction with no memory operand :

$$\begin{aligned} &= 10 + (1 - 0.9) * (200 + (1 - 0.99) * 450) \\ &= 10 + 0.1 * (200 + 0.01 * 450) \\ &= 10 + 0.1 * (200 + 4.5) \\ &= 10 + 20 + 0.45 \\ &= 30.45ns \end{aligned}$$

Instruction with one memory operand :

$$\begin{aligned} &= 30.45 + 20 + (1 - 0.85) * (200 + (1 - 0.99) * 450) \\ &= 30.45 + 20 + 0.15 * (200 + 4.5) \\ &= 30.45 + 20 + 30 + 0.675 \\ &= 80.45 + 0.675 \\ &= 81.125ns \end{aligned}$$

Instruction with two memory operand :

$$\begin{aligned} &= 30.45 + 2 * (20 + 30 + 0.675) \\ &= 30.45 + 100 + 1.35 \\ &= 130.8ns \end{aligned}$$

and finally AMAT:

$$\begin{aligned} &= 30.45 * 0.5 + 81.125 * 0.35 + 130.8 * 0.15 \\ &= 15.22 + 28.393 + 19.62 \\ &= 63.233ns \end{aligned}$$

## 2 Problem 2

0 →	00000000
21 →	00010101
23 →	00010111
35 →	00100011
76 →	01001100
1 →	00000001
66 →	01000010
80 →	01010000
54 →	00110110
36 →	00100100
24 →	00011000
23 →	00010111
75 →	01001011
2 →	00000010

address	#1	#2	#3
0	miss	hit	hit
21	miss	hit	hit
23	hit	hit	hit
35	miss	hit	hit
76	miss	hit	hit
1	hit	hit	hit
66	hit	hit	hit
80	miss	hit	hit
54	miss	hit	hit
36	hit	hit	hit
24	hit	hit	hit
23	hit	hit	hit
75	hit	hit	hit
2	hit	hit	hit

$$\begin{aligned}\text{miss rate} &= \\ &= \frac{7}{14 * 3} = \frac{1}{6}\end{aligned}$$