In The Name of God

Computer Architecture Homework 1

Parham Alvani

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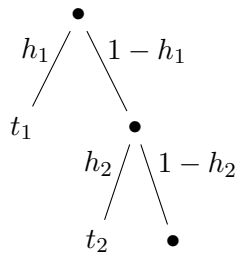
Contents

1 Problem 2

1

2 According to following diagram :



- Average Memory Access Time, the exact formula

(1)

- Average Memory Access Time, an approximate formula

$$h_1 * t_1 + (1 - h_1)[h_2 * t_2 + (1 - h_2)(\ldots)] \tag{2}$$

3

4

5

2 Problem 3

The following is the avrage memory access time equlation for memory with 3 level:

$$\bar{T} = h_1 * t_1 + (1 - h_1) * h_2 * t_2 + (1 - h_1) * (1 - h_2) * h_3 * t_3 \tag{3}$$

Substituting $1ns$ for t_1, 0.1 for h_1, $10ns$ for t_2, 0.5 for h_2, $1000ns$ for t_3 and 1 for h_3 in (3) gives us:

$$\begin{aligned}
\bar{T} &= 0.1 * 1 + (1 - 0.1) * 0.5 * 10 + (1 - 0.1) * (1 - 0.5) * 1000 \\
&= 0.1 + 0.9 * 0.5 * 10 + 0.9 * 0.5 * 1000 \\
&= 0.10 + 0.45 * 10 + 0.45 * 1000 \\
&= 0.10 + 4.50 + 450.00 \\
&= 454.60ns
\end{aligned}$$

3 Problem 4

The following is the avrage memory access time equlation for memory with 4 level:

$$\bar{T} = h_1 * t_1 + (1-h_1) * h_2 * t_2 + (1-h_1) * (1-h_2) * h_3 * t_3 + (1-h_1) * (1-h_2) * (1-h_3) * h_4 * t_4 \quad (4)$$

Substituting $1ns$ for t_1, 0.1 for h_1, $10ns$ for t_2, 0.5 for h_2, $8s$ for t_3, 0.63 for h_3,$1000ns$ for t_4, 1 for h_3, in (4) gives us:

$$\begin{aligned}
\bar{T} &= 0.1 * 1 + (1 - 0.1) * 0.5 * 10 + (1 - 0.1) * (1 - 0.5) * 0.63 * 8 + \\
&\qquad (1 - 0.1) * (1 - 0.5) * (1 - 0.63) * 1000 \\
&= 0.1 * 1 + 0.9 * 0.5 * 10 + 0.9 * 0.5 * 0.63 * 8 + 0.9 * 0.5 * 0.37 * 1000 \\
&= 0.10 + 0.45 * 10 + 0.28 * 8 + 0.16 * 1000 \\
&= 0.10 + 4.50 + 2.24 + 160.00 \\
&= 166.84ns
\end{aligned}$$

4 Problem 5