

Exercise 1

In a 8 bit processor the organisation of the memory must be changed as follows (a,b and c are the address pins produced by the processor and α, β and γ are the address lines connected to the memory chip. Boolean transformation expression must be found for transforming a,b and c into α, β and γ)

Logic memory	Physical memory
h ...111	f ...111
g ...110	h ...110
f ...101	g ...101
e ...100	e ...100
d ...011	b ...011
c ...010	d ...010
b ...001	c ...001
a ...000	a ...000

Logic memory

Physical memory

How must be \underline{a} , \underline{b} and \underline{c} (least significant bits of the logic address – the address issued by the processor) transformed into $\underline{\alpha}$, $\underline{\beta}$ and $\underline{\gamma}$ (least significant bits of the physical address – the address of the physical chip) which allows the displayed physical memory organisation?

Solution

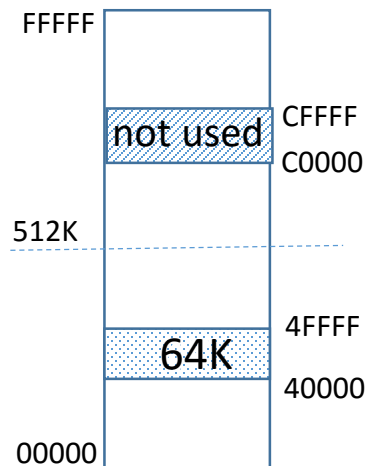
Obviously $\beta = b$ and $\gamma = c$ then since α is 1 only for the slots storing b and c where a and b are mutually exclusive we have that

$$\alpha = ab^* + a^* b$$

Exercise 2

In a 20 bit address system (8 bit data parallelism) using static RAM devices determine the simplest logical expression of the CS of each device which implement the 64 K bank starting at address 256K when the corresponding 64K bank in the second half of the memory is not used by the processor and is never physically implemented.

Solution. To implement a 64K bank 32K devices must be used because it is a RAM bank. The 64 K bank starts at address 40000 and ends at address 4FFFF. The bank C0000-CFFFF is unused. We can therefore simplify the expressions of the two 32K devices removing A19 address line from CS of the used devices..



$$CS0 = \cancel{A19}^* A18 A17^* A16^* A15^*$$

$$CS1 = \cancel{A19}^* A18 A17^* A16^* A15$$

Exercise 3

Describe *in detail* the behaviour of the Tomasulo architecture, its characteristics and limits and how these limits have been removed in the modern architectures.

Notice: the exam papers should be easily **READABLE** which means that no *decryption* should be necessary for the correction, that page 2 follows page 1 etc otherwise **I will not correct them with obvious consequences.**