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Lista 1 - ADC2

1.1.

IBM power 5
- Die size (mm^2) = 389
- Defect rate (/cm^2) = 0,3 = $0,3 \cdot 10^{-2}$ per mm^2
- Manufacturing size (nm) = 130
- Transistors (millions) = 276

$$\text{Die yield} = \left(1 + \frac{\text{Defects per area} \cdot \text{Die area}}{\alpha}\right)^{-\alpha} \quad \alpha = 4$$

$$\text{Die yield} = \left(1 + \frac{0,3 \cdot 10^{-2} \cdot 389}{4}\right)^{-4} = 0,36$$

1.1.b. Provavelmente devido ao seu Manufacturing size ser maior, o que torna sua fabricação mais simples.

1.2.a) Woods
- 150 mm^2
- $20

$$\text{Dies per wafer} = \frac{\pi (\text{Wafer diameter}/2)^2}{\text{die area}} - \frac{\pi \cdot \text{Wafer diameter}}{\sqrt{2 \cdot \text{Die area}}}$$

$$= \frac{\pi (300/2)^2}{150} - \frac{\pi \cdot 300}{\sqrt{2 \cdot 150}} = 416,82 \approx 416$$

416 chips per wafer.

$$\text{Dies yield} = \left(1 + \frac{0,3 \cdot 10^{-2} \cdot 150}{4}\right)^{-4} = 0,653 \text{ (rendimento)}$$

defect-free-chip = 0,653 · 416 = 271 chips

Profit = 271 · 20 = $5420

b) Markon { 250 mm²
$25

dies per wafer = $\frac{\pi \cdot (300/2)^2}{250} - \frac{\pi (300)}{\sqrt{2 \cdot 250}} = 240$ chips

dies yield = $\left(1 + \frac{0,3 \cdot 10^{-2} \cdot 250}{4}\right)^{-4} = 0,50$

free-defect chips = 240 · 0,5 = 120

Profit = 120 · 25 = 3000

c) O Woods, devido ao seu maior lucro.

d) Devemos priorizar o Woods.

$\frac{50000}{416} = 120,19 \approx 121$ wafers

O restante, 79 wafers, devem ser usados para o Markon

1.4.a) System = 66w + 2·2,3w + 7,9w = 78,5

$x - 1 \rightarrow x = 98,125w$

78,5 − 0,8

b) 0,6 · 4w + 0,4 · 7,9 = 5,56w

c) { s400 → 7w
7200 → 7,9w but 75% of time.

$$\begin{cases} t_{7200} = 0,75 t_{s400} \\ t_{7200} + tidle_{7200} = 100 \\ t_{s400} + tidle_{s400} = 100 \\ t_{7200} \cdot 7,9 + tidle_{7200} \cdot 4 = t_{s400} \cdot 7 + tidle_{s400} \cdot 2,9 \end{cases}$$

Resolvendo a eq. (usei software :)) temos que $tidle_{7200} = 29,78\%$

1.11) a = b

1.17) a e c

1.5.a) Server = 66W + 2,3W + 7,9W = 76,20W

$\frac{14\,kW}{76,2W} = 183,73 \text{ servers} = 183 \text{ servers}$

b) Server = 66W + 2,3W + 2·7,9W = 84,10W

$\frac{14\,kW}{84,10} \approx 166 \text{ servers}$

1.11) $MTTF = \frac{10^9}{100} = 10^7$

b) $\text{Availability} = \frac{MTTF}{(MTTF + MTTR)} = \frac{10^7}{(10^7 + 24)} \approx 1$

1.17.a) { First = 80%
rest = 20%

{ Part parallelized → speed-up = 2
40% of first aplication is parallelizable.

$\text{Speedup} = \frac{1}{(1 - \text{Fraction}_{\text{one}}) + \frac{\text{Fraction}_{\text{one}}}{\text{Speedup}_{\text{e}}}} = \frac{1}{(1-0,4) + \frac{0,4}{2}} = 1,25$

c) $\frac{1}{(0,2 + 0,8 \cdot 0,6 + 0,8 \cdot \frac{0,4}{2})} = 1,19$

(0,2 rest; 0,8·0,6 60%; 0,8·0,4/2 improved)