200104004095

Hw-1

	diameter (çap)	cost per wafer	kalıp Dies per wafer	kusurlu Defects/cm
Q1A wafer x	16cm	15	64	0,02
wafer y	20cm	24	100	0,03

? $\boxed{\text{find wafer and die area for x and y}}$

Yield = $\dfrac{\text{No. of good chips per wafer}}{\text{total num. of chips per wafer}} \times 100\%$

wafer area ~~x~~ x $\pi r^2 \Rightarrow r_x = 8cm \rightarrow \pi \cdot 64cm^2 = 200{,}96cm^2$

$r_y = 10cm \rightarrow \pi \cdot 100cm^2 = 314cm^2$

die area = wafer area / Dies per wafer

die_area_x = $200{,}96cm^2 / 64 = 3{,}14cm^2$

die_area_y = $314cm^2 / 100 = 3{,}14cm^2$

Q.1.B

Scanned with CamScanner

Q.1.B

$$\text{yield} = \frac{1}{(1 + (\text{Defects per area} \times \text{Die area})/2))^2}$$

$$\text{yield\_x} = \frac{1}{(1+(0{,}02 \cdot 3{,}14/2))^2} = 0{,}94 = 94\%$$

$$\text{yield\_y} = \frac{1}{(1+(0{,}03 \cdot 3{,}14/2))^2} = 0{,}912 \quad 91{,}2\%$$

Cost per die = cost per wafer / (dies per wafer x yield)

Cost_per_die_x = 15 / 64 . 0,94 = 0,2203

cost_per_die_y = 24 / 100 . 0,912 = 0,2188

A

Q.1.C cost (-20%) num. of dies (+10%) defects_per_area (+15%)

A
- wafer areas are same
- die_per_wafer_x =

	x	y
die_per_wafer	70	110

- die_area_x = 200,96 cm^2 / 70 = 2,87 cm^2 ✓
- die_area_y = 314 cm^2 / 110 = 2,854 cm^2 ✓

B
- Defects per area

	x	y
Defects per area	0,023	0,0345

- yield_x $= \dfrac{1}{(1+(0{,}023 \cdot 2{,}87/2))^2} = 93{,}7\%$ ✓
- yield_y $= \dfrac{1}{(1+(0{,}0345 \cdot 2{,}854/2))^2} = 90{,}8\%$ ✓

- cost_wafer

	x	y
cost_wafer	12	19,2

k

	x	y
• cost_ water	12	19,2

• Cost. per die (x) = 12 / (0,937 · 70) = <u>0,1829</u> ✓

• cost per die (y) = 19,2 / (0,908 · 110) = <u>0,1922</u> ✓

<u>Comparing</u>

x → New ones 0,0374 $ cheaper according to the before year

y → New ones 0,0266 $ "

Q2.A

	P1	P2
	3 GHz	1.5 GHz
R	600,000,000	900,000,000
I	2,000,000,000	1,500,000,000
J	600,000,000	600,000,000
+	3,200,000,000	3,000,000,000 ✓

cycles

Program

- 1 billion inst.
- R → %30   I → 50%   j → 20%

Q2.B)

P1 → $\frac{3,200,000,000}{1,000,000,000} = 3,2$ ✓

P2 → $\frac{3 \text{ billion}}{1 \text{ billion}} = 3$ ✓

Q2.C P1 → 3 billion → in 1 second

3,2 billion → in 1,066 seconds ✓

P2 → 1,5 billion → in 1 sec.

3 billion → in 2 sec ✓

Q2.D P1 is faster $\frac{2}{1{,}066}$ times than P2

in this program