CENG3420 - Computer Organization & Design
Homework 1

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Question 1. (10%) This is a question about integrated circuit cost. Assume that a wafer contains 4096 dies and a die has 0.15 defects on average, please answer the following sub-questions.

1. Calculate the yield of this wafer. (5%)
2. Assume that you wanted to spend 10 millions HKD on manufacturing, how much money can you save for manufacturing the same number of dies if the average defects of a die can be reduced to 0.075? (5%)

Answer:

1.
$$\text{Yield} = \frac{1}{[1 + (0.15 \div 2)]^2} = \frac{1600}{1849} = 86.5\%$$

2. Lets assuem the cost per wafer is \$C
   Then,
$$\text{Cost per die} = \frac{C}{\text{Die per wafer} \times \text{Yield}}$$
   Therefore,
$$\begin{aligned} \text{Saved money} &= 10,000,000 \times (\frac{\text{Yield}_{0.15}}{\text{Yield}_{0.075}} - 1) \\ &= 10,000,000 \times \{\frac{[1 + (0.15 \div 2)]^2}{[1 + (0.075 \div 2)]^2} - 1\} \\ &= 10,000,000 \times \frac{507}{6889} \\ &= \$735,956 (\text{round off to the nearest dollar}) \end{aligned} \tag{1}$$