CSE 331

Computer Organizations

Homework 1

Due Date 30/10/2020 Friday 17:00

1. Assume that, today, a wafer containing 120 processor dies costs 10000$. The yield decreases by 10% at each year while the wafer cost also decreases by 20% at each year. Then, what will be the cost of a single chip manufacturing after 4 years? Show your computations. Edit: Assume, today, there is a yield of 80%.

End of the first year :

Cost = 10000 * (0.8)

Yield = 80 * (0.9)

End of the fourth year:

Cost = $10000 * (0.8)^4 = 4096$$

Yield = $80 * (0.9)^4 = 52.488\%$

120 * (52.488/100) = 62.9856

Cost of a single chip = 4096/62.9856 = 65.030737184$

2. A compiler designer wants to compare the performance of two different compilers he designed. The compilers are generating MIPS machine code from a C program. He compiles the same C program using the two compilers.

a. According to the tables below, find which compiler is better and by how many times it is better than the other?

	R-type (x10 ^{6})	I-Type (x10 ^{6})	J-Type (x10 ^{6})
Compiler A	50	10	2
Compiler B	80	5	1

	R-type	I-Type	J-Type
Required Cycles	2	4	3

Total cycle for compiler A = (2 * 50) + (4 * 10) + (3 * 2) = 146 ($x10^{6}$)

Total cycle for compiler B = (2 * 80) + (4 * 5) + (3 * 1) = 183 ($x10^{6}$)

Compiler A better than B (183 / 146 = 1.25 times)

b. What must be the clock speed of the processor so that the program compiled with the better compiler executes in 100ms?

100ms = cycle / clock rate

100 ($x10^{-3}$) = 146 ($x10^{6}$) / clock rate

Clock time = 0.685 ns

Clock rate = 146 ($x10^{6}$) / 100 ($x10^{-3}$) = 1.46Ghz