Answers in cm is ok

CECS 341 - Practice problems 1

1. Consider three different processors P1, P2, and P3 executing the same instruction set. P1 has a 2.5 GHz clock rate and a CPI of 1.8. P2 has a 2.8 GHz clock rate and a CPI of 1.5. P3 has a 3.2 GHz clock rate and has a CPI of 2.2.
    a. Determine each processor's performance expressed in instructions per second.
    b. Which processor has the highest performance and why?
    c. We are trying to reduce the execution time /CPU time/ by 30% but this leads to an increase of 20% in the CPI. What clock rate should we have for each processor to get this time reduction?

2. A certain program has the following instruction classes, CPIs, and mixtures:

Instruction Type	CPI	ratio
A	1.5	.40
B	2.1	.35
C	3	.25

    a. What is the average CPI for this processor?

    b. You have the following options:
        - Option 1: Reduce the CPI of instruction type B to 1.8
        - Option 2: Reduce the CPI of instruction type C to 2.5

    Which option would you choose and why?

3. Consider three different processors P1, P2, and P3 executing the same instruction set.
    P1 has a 450 MHz Clock rate and a CPI of 1.75
    P2 has a 227 MHz Clock rate and a CPI of 2.0
    P3 has a 2.3 GHz Clock rate and a CPI of 5.0

If the processors each execute a benchmark program in 750 milliseconds, find the number of clock cycles and the number of instructions for each processor to execute the benchmark program.

4. Problem from the book (1.10.) Assume a 15 cm diameter wafer has a cost of 12, contains 84 dies, and has 0.020 defects/cm^2. Assume a 20 cm diameter wafer has a cost of 15, contains 100 dies, and has 0.031 defects/cm^2.

1.10.1 [2] <COD §1.5> Find the yield for both wafers.

1.10.2 [2] <COD §1.5> Find the cost per die for both wafers.

1.10.3 [2] <COD §1.5> If the number of dies per wafer is increased by 10% and the defects per area unit increases by 15%, find the die area and yield.

1.10.4 [2] <COD §1.5> Assume a fabrication process improves the yield from 0.92 to 0.95. Find the defects per area unit for each version of the technology given a die area of 200 mm^2.

5.

[20/20/20/20] <1.6> It costs $1 billion to build a new fabrication facility. You will be selling a range of chips from that factory, and you need to decide how much capacity to dedicate to each chip. Your Woods chip will be 150 mm^2 and will make a profit of $20 per defect-free chip. Your Markon chip will be 250 mm^2 and will make a profit of $25 per defect-free chip. Your fabrication facility will be identical to that for the Power5. Each wafer has a 300 mm diameter.

a. [20] <1.6> How much profit do you make on each wafer of Woods chip?

b. [20] <1.6> How much profit do you make on each wafer of Markon chip?

c. [20] <1.6> Which chip should you produce in this facility?

Assume 0.040 defects/cm^2

6.

[20/20/20/20] <1.6, 1.9> Your company's internal studies show that a single-core system is sufficient for the demand on your processing power; however, you are exploring whether you could save power by using two cores.

a. [20] <1.9> Assume your application is 80% parallelizable. By how much could you decrease the frequency and get the same performance?

b. [20] <1.6> Assume that the voltage may be decreased linearly with the frequency. Using the equation in Section 1.5, how much dynamic power would the dual-core system require as compared to the single-core system?

7. Suppose we want to enhance performance of the system, by enhancing the processor. The new processor is 10 times faster. Assuming that 40% of the time is spent on computation, and reaming 60% on I/O operations, compute the overall speedup that gained by incorporating new processor.

8. List two characteristics of the following categories:

a) personal mobile device

b) cloud computing

9. Give at least one example of each of the following classes of:

a) embedded computer:

b) supercomputers:

10. Define Moor's law

11. What is abstraction and how is it used to simplify design?

12. List 4 components that each computer has.

13. What is Silicon Ingot, and what is a wafer?