Skill Assessment #1

Graded

Student

HARRY KIM

Total Points

67.5 / 75 pts

Question 1

A1 - Different Processors, Same Freq., Relative CPI

21.25 / 25 pts

✔ **+ 21.25 pts** Good

Score = Execution time of unknown / execution time of known.

Question 2

A2 - Similar Processors, Different Freq., Relative CPI

21.25 / 25 pts

✔ **+ 21.25 pts** Good

The relative performance we are given is the Execution time of an unknown processor/ the Execution time of the processor you chose. Using that you can solve for the ratio of execution times.

Your answer is correct, however the methodology to get there does not follow correctly.

Question 3

A3 - Yield Insights

10 / 10 pts

✔ **+ 10 pts** Correct

Question 4

A4 - MIPS Code Results

15 / 15 pts

✔ **+ 15 pts** Excellent

Question 5

Late Deduction

0 / 0 pts

✔ **+ 0 pts** On time

Questions assigned to the following page: 1 and 2

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Skill Assessment #1

A1. The two CPUs I chose for this problem were the Intel Core i9-11900 F @ 2.50 GHz and the Intel Core i5-10300 H @ 2.50 GHz since they both have identical clock rates but have different single thread ratings at 3568 and 2638 respectively. To do this problem, I used two equations:

performance = 1 / execution_time

execution_time = #_of_instructions * CPI * clock_period

By setting up the equation with the two different CPUs, I got the following equations:

For the i9-11900 F: 3568 = 2.5 *10^9 hz / #_of_instructions * CPI

For the i5-10300 H: 2638 = 2.5*10^9 hz / #_of_instructions * CPI

Knowing that the single thread rating was a ratio of the CPU currently being used and some mystery base CPU, we could simply divide the two equations of the CPUs to get a ratio which cancels out the clock_period, #_of_instructions, and the CPI.

3568/2638 = 1.3525

By taking the ratio (dividing the equation of the i9 by the i5), I found that the i9-11900 F @ 2.50 GHz has a CPI that is 135.25% of the CPI of the Intel Core i5-10300 H @ 2.50 GHz.

A2. The two CPUs I chose for this problem were the Intel Core i9-11900 KF @ 3.50 GHz with a single thread rating of 3607 and the Intel Core i9-11900 F @ 2.50 GHz with a single thread rating of 3568 since they are of the same family, model, and number of cores but have different clock rates. Using the same performance and execution_time equations, we can set up the following equations:

For the Intel Core i9-11900 KF: 3607 = 3.5 *10^9 hz / #_of_instructions * CPI

For the Intel Core i9-11900 F: 3568 = 2.5 *10^9 hz / #_of_instructions * CPI

Like in A1, the #_of_instructions and CPI cancel out if we take the ratio, but this time the clock_period does not.

3607 / 3568 = 3.5 *10^9 / 2.5 *10^9

1.0109 = 1.4

Then we must divide both sides by 1.4 which leaves us with:

Questions assigned to the following page: 2, 3, and 4

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1.0109 / 1.4 = 0.7220

So the Intel Core i9-11900 KF @ 3.5 GHz has a CPI that is 72.2% of the CPI of the Intel Core i9-11900 F @ 2.50 GHz. The CPI of the lower rated CPU is higher than that of the higher rated CPU. My best guess as to why this would be the case is that the processor with the slower clock period requires fewer instructions to do the same task as the processor with the higher clock period.

A3. By looking at the equation for the yield of chip production, we can see that increasing the defects per cm^2 decreases the yield.

Yield = 1 / (1 + defects_per_area * die_area / 2)

This means that for the yield to increase while also increasing the defects, the die area would have to become smaller which would lead to more dies per wafer and an increase in yield.

A4.

- When I enter my UID without the ‘u’ (1226472), the answer I get is 735883.
- To get the program to give back my UID number, I have to type in 2044121.
- The program uses simple integer division to divide the input by 2 then add 10% of the original number to the quotient.

1226472 / 2 = 613236

1226472 / 10 = 122647 (122647.2 is truncated to get 122647)

613236 + 122647 = 735883