**CSE 140 Lab/HW#2**

# Performance (20pts)

2. Consider two processors P1 and P2 executing the same instruction set. And, their clock rate and CPI are like below:

|  |  |  |
| --- | --- | --- |
|  | P1 | P2 |
| Clock rate | 3 GHz | 4 GHz |
| CPI | 1.5 | 2 |

For the two processors, solve the following problems. Round off the calculated results to two decimal places if needed.

1. Which processor has the highest performance expressed in instructions per second?

* Clock rate divided by CPI is how many instructions per second are processed. Processor 1 instructions per second is 2. Processor 2 instructions per second is 2. Both processors can work 2 instructions per second thus making them both preform equally.

1. Suppose that both processors took 100 seconds to run a program. We want to achieve 2x speedup in running this program on both processors by increasing clock frequency. But, we found that the frequency increase led to an increase of CPI by 10% and 20% for P1 and P2, respectively. So, we adjusted the clock frequency to accommodate the new CPI. What would be the final clock frequency of each of the two processors?

* Current execution time: 100s New execution time: 100/2 = 50s
* (# of instruction) x (CPI) / (clock rate) = execution time
* 1 GHz = 1 \* 10^9 Hz

Processor 1:

* 100 = (# of instructions)\*(1.5) /( 3 \*10^9) 🡪 (# of instructions) = 2 \* 10^11

Processor 2:

* 100 = (# of instructions)\*(2) / (4 \*10^9) 🡪 (# of instructions) = 2 \*10^11

New Processor 1:

* New CPI = 1.5 + (10 /100) \* 1.5 🡪 New CPI = 1.65
* 50 = (2 \* 10^11) \* (1.65) / x 🡪 6.6 \* 10^9 Hz 🡪 6.6 GHz

New Processor 2:

* New CPI = 2 + (20 /100) \* 2 🡪 New CPI = 2.4
* 50 = (2 \* 10^11) \* (2.4) / x 🡪 9.6 \* 10^9 Hz 🡪 9.6 GHz