3055 Quiz 2

1. (*5 points*) A RISC processor and a CISC processor are running the same application program and they take the same amount of execution time. The RISC processor has an average CPI of 1.25 and the CISC processor has a CPI of 5. The CISC processor has a 3GHz clock and the RISC processor has a 4GHz clock.

$$\#RI \times 1.25 \times \frac{1}{4}GHZ = \#CI \times 5 \times \frac{1}{3}GHZ$$

$$\frac{\#RI}{\#CI} = \frac{4 \times 5}{1.25 \times 3} = \frac{20}{3.75} = 5.333$$

For this benchmark program, the ratio RISC/CISC #instructions is __5.333__ (accurate to three decimal places)

2. (*5 points*) A computer hardware designer is considering adding a faster hardware divide circuit to a processor. The new divide hardware would be 64 times faster during divide operations. If a benchmark program spends 3% of it's 10ms execution time doing divide, how fast would the program run with the new divide hardware?

$$9.7 + \frac{3}{64} = 9.747$$

Execution time with new divide hardware = __9.747 ms__

Another option the designer is considering would use the same amount of hardware (as the new divider) to make a larger Cache for the Processor. A simulation shows the larger Cache would reduce the CPI from 1.25 to 1.23.

$$10ms = \#inst \times 1.25 \times \text{clock rate}$$
$$x = \#inst \times 1.23 \times \text{clock rate}$$

$$\frac{10ms}{x} = \frac{1.25}{1.23}$$

Execution time with larger cache (no new divide) = __9.84 ms__

Which new hardware option gives the best performance gain?

For this application the divide hardware option has the best performance gain