

Score: _____ Name: _____

ECE 3055 Quiz 1

1. (4 points) An Intel 4 GHz X86 (CISC) processor runs the SPEC2006 Benchmark Programs shown in the table below. Fill in the missing table entries.

$$1000 = (336 \times 10^9 \times \text{CPI}) / 4 \times 10^9 \quad \text{CPI} = 11.9$$

$$(2118 \times 10^9 \times .67) / 4 \times 10^9 = 354.7$$

Benchmark	Instructions $\times 10^9$	Execution time (sec)	Average CPI
mcf	336	1000	11.9
perl	2118	354.7	.67

2. (6 points) A hardware designer is evaluating additional hardware design improvements for a new processor. Based on marketing and benchmark analysis, it has been estimated that the average customer workload for the current processor design executes multiply 20% of the time and divide 5% of the time.

$$\frac{1}{(.8 + \frac{.2}{64})} = 1.23$$

With a new hardware multiplier that executes the multiply operations 64 times

faster, the workload could be executed up to 1.23 times faster.

$$\frac{1}{(.95 + \frac{.05}{16})} =$$

With a new hardware divider that executes the divide operations 16 times faster,

the workload could be executed up to 1.049 times faster.

$$\frac{1}{(.75 + \frac{.2}{64} + \frac{.05}{16})} = 1.32$$

With both hardware improvements (i.e., multiply and divide), the workload could

be executed up to 1.32 times faster.