CSE 5600 – Practice Problem Set 1

1. Of the three factors in the fundamental performance equation:

$$\text{Execution Time} = \frac{\text{instructions}}{\text{program}} \times \frac{\text{seconds}}{\text{cycle}} \times \frac{\text{cycles}}{\text{instruction}}$$

Which is most influenced by:

(a) The technology
(b) The compiler
(c) The computer architect

2. When running an integer benchmark on a RISC machine, the average instruction mix was as follows:

Instructions	**Average Frequency**
Load	26%
Store	9%
Arithmetic	14%
Compare	13%
Conditional Branch	16%
Unconditional Branch	1%
Call/Return	2%
Shift	4%
Logical	9%
Misc.	6%

The following measurements of average CPI (cycles per instruction) for individual instruction categories were made:

Instruction type	**Average CPI (clock cycles)**
All ALU instructions	1.0
Load-store	1.4
Conditional branches:	
Taken	2.0
Not Taken	1.5
Jumps	1.2

Assume that 60% of the conditional branches are taken and that all instructions in the Misc. category are ALU instructions. What is the CPI of the benchmark on this RISC machine?