ECE 429 / 629 Homework #3

This homework covers Section 1.3, B.1-B.10 of the textbook; and COD 3.1-3.8.

1. Classify the non-floating point instructions listed in Fig. B.27 on p. B-41 into the following categories: ALU instructions, memory loads/stores, conditional branches, and unconditional jumps. Be careful to think through the meaning of each instruction, because some instructions have potentially misleading names (e.g., load immediate, conditional move). Now suppose we have the following measurements of average CPI for the instruction categories:

instruction type	clock cycles
ALU	1.0
memory load/store	1.4
conditional branch	
Taken	2.0
not taken	1.5
unconditional jump	1.2

Suppose that 60% of the conditional branches are taken. Using the gcc instruction mix in Fig. B.27, compute the effective CPI (also known as the *overall CPI*) using the formula on p. 43.

2. Translate the following C code to MIPS32 assembly language and machine code:

```
int i, j;  // in R6 and R7
while (i != j)
{
    j = j+i;
    i++;
}
```

Make the loop as tight as possible, and write the resulting machine code in hexadecimal.

3. Disassemble the following MIPS32 code.

```
00010100011110000000000000000011
00100000010110000000000000010100
00010000001100000000000000000001
00000001100000110011000000100000
00000000100000101110100000100010
```

4. Figure B.7 on p. B-11 mentions TeX. What is TeX and who wrote it? What multi-volume work inspired its development?

Textbook: Hennessy and Patterson, *Computer Architecture: A Quantitative Approach*, 4th edition, Morgan Kaufmann, 2007.