1. A program executes in 10 sec on a particular computer. The computer’s branch-processing subsystem is upgraded so that branch instructions execute twice as fast as before. After the upgrade, the original program runs in 8 sec. What fraction of the program’s instructions is branch instructions?

2. You are evaluating two ‘C’ compilers, A and B, for your computer. You compile the same test program using each compiler. The compiled code from compiler A has an instruction count of $1000_{10}$ instructions, and average CPI of 2. The compiled code from compiler B has an instruction count of $1200_{10}$ instructions. When you run the two programs, you find that the CPU time for the two versions is equal. What is the average CPI for the code compiled with compiler B?

3. A data word is stored by a MIPS processor at memory address $1000_{10}$. What is the memory address of the least-significant byte of the data word?
4. Write a MIPS code segment for the ‘C’ statement:
   \[ A = 5 + B[C] \]
   Assume that A is in $s0, the base address of B is in $s7, and the address of the memory variable C is in $t3.

5. Encode the MIPS instruction:
   \[ \text{addi } s1, s2, -17 \]
   Show the contents of each field in binary.

6. Encode the MIPS instruction:
   \[ \text{lw } s3, 65_{10}(t0) \]
   Show the contents of each field in hexadecimal.

7. Encode the MIPS instruction:
   \[ \text{bne } s1, s2, L1 \]
   where the label L1 refers to memory address 1000 and the bne instruction is located at memory address 500. Show the contents of each field in binary.

8. Encode the MIPS instruction:
   \[ \text{j } L2 \]
   where the Jump instruction is located at address 12345678 and the label L2 refers to address 76543210. Show the contents of each field in hexadecimal.