

**KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
COMPUTER ENGINEERING DEPARTMENT**

COE 308-01, Term 982

Homework #1

Due Date: Wednesday February 10

You are the lead designer of a new processor. The processor design and compiler are complete and now you must decide whether to produce the current design as it stands or spend additional time to improve it. You discuss this problem with your hardware engineering team and arrive at the following options:

- a. *Leave the design as it stands.* Call this base machine *Mbase*. It has a clock rate of 50MHz, and the following measurements have been made using a simulator:

| Instruction Type | CPI | Percentage of instructions executed |
|------------------|-----|-------------------------------------|
| A | 2 | 40% |
| B | 3 | 25% |
| C | 3 | 25% |
| D | 5 | 10% |

- b. *Optimize the hardware.* The hardware team claims that it can improve the processor design to give it a clock rate of 60 MHz. Also the CPI of some instructions can be improved. Call this machine *Mopt*. The following measurements were made for *Mopt*:

| Instruction Type | CPI | Percentage of instructions executed |
|------------------|-----|-------------------------------------|
| A | 2 | 40% |
| B | 2 | 25% |
| C | 3 | 25% |
| D | 4 | 10% |

- 1) What is the average CPI for *Mbase* and *Mopt*?
- 2) What is the MIPS rating for *Mbase* and *Mopt*?
- 3) How much faster is *Mopt* than *Mbase*.