Assignment 5
(**Due date: 10/21/2009/Wednesday, in class**)

| Your name: | Grade: |
|---|---|
| | |

**Important notice** on how to submit and grade this assignment:

- Write your answers on **different papers** from the question sheets; otherwise, they will **NOT** be graded.
- You do **NOT** have to write the question text, but you need to **write the question number** for each question.
- Put your solutions in the **same order** as the questions appear on the assignment; otherwise, **missed or misplaced** solutions will **NOT** be graded.
- **How to Grade:**
  - The total score for the assignment is **100** points.
  - **An extra 8%** will be added to the **TYPEWRITTEN** submissions.
  - **3 points will be deducted** from your total score if you **missed any ONE** of the following (this is a *cumulative penalty*, e.g., 9 points will be taken for 1 missed name and 2 missed required blank lines):
    - **Your name** and **assignment number** on the top of each solution sheet/paper,
    - At least **one blank line** between solutions of adjacent questions (**except for** those of *Multiple Choice* or *True/False* questions).

1. The steps that the LMC performs are closed related to the way in which the CPU actually executes instructions. Draw a flow chart (like the ones shown in the class) that describes the steps that the LMC follows to execute a branch (branch-always) instruction (**Hand-drawing is acceptable**).

2. Draw a flow chart that describes the steps that the LMC follows to execute a subtract instruction (**Hand-drawing is acceptable**).

3. Using the LMC simulator (accesses via the course website), compile and test the following LMC program.

```
000:  INP
      STA  N1
      INP
      ADD N1
      OUT
      HLT
N1    DAT 0
```

1) Describe in English the function of the code segment on the left (what does it do)?

2) After successfully testing the code, record the inputs you provided for the testing, and write down the values of the Program Counter and Accumulator.

4. Using the LMC simulator (accesses via the course website), compile and test the following LMC program.

```
000:  INP
      STA  N1
      INP
      STA  N2
      SUB N1
      BRP LOOP
      LDA  N1
      OUT
      HLT
LOOP  LDA N2
      OUT
      HLT
N1    DAT  0
N2    DAT  0
```

1) Describe in English the function of the code segment on the left (what does it do)?

2) Record the values of the Program Counter and Accumulator for each of the following 2 sets of inputs:

   a. 3, 9.

   b. 9, 3