Assignment 5
(**Due date: 10/29/2009, Thursday, in class**)

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

**Important notice** on how to submit and grade this assignment:
- Provide 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 5%** 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.

1. List at least 3 household electronic appliances that use embedded computing systems.

2. Provide some common features of embedded systems.

3. List and explain at least 3 common metrics in designing embedded systems.

4. What is Moore's law?

5. What are unit cost and NRE cost design metrics for embedded systems. Figure out a formula on how to calculate per-product cost for a certain appliance that utilizes embedded system.

6. Download and watch the two video clips of robot-exploring-the-maze. Now suppose you are to design such a robot by using embedded computing techniques. Briefly describe the design issues (such as what input/output devices and other hardware chips (including CPU…) you have to use, what are the features of these devices, …).

7. Provide brief answers for the following questions regarding PIC microcontroller (you may need to check the lecture slides and/or the website http://en.wikipedia.org/wiki/PIC_microcontroller):
   1) What if Harvard architecture?
   2) What is PIC microcontroller?
   3) Why MPLAB software package is used?
   4) List at least 3 of its *core architecture features*.
   5) Following are several instructions for the PIC12 ( 12-bit PIC instruction set for Baseline core devices). Explain their functions in detail (e.g., don't use the technical terms that are exclusive to PIC series, for example, "Move W to f". You need to be specific, saying "**moving the content of the accumulator *W* to the memory cell or register whose address is *f***").:
      * 0000 011 00011
      * 0001 110 00010
      * 0001 111 00010