

Assignment 3
(Due date: 10/13/2009, Tuesday, in class)

Your name:	Grade:
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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. The steps that the LMC performs are closely 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.

2. Draw a flow chart that describes the LMC follows to execute a subtract instruction.

3. What are the criteria that define a von Neumann architecture?

4. What is the difference between an assembler and a compiler?

5. What is the difference between a declarative statement and an imperative statement?

6. List some common data types and describe how to use them for representing personal information such as *ages, height, name...*?

7. Identify some common control structures found in imperative and object-oriented programming languages.

8. What is the difference between a global variable and a local variable?

9. What is the difference between a procedure and a function?

10. Draw the parse tree for the expression: $x * y + x + z$. (* is multiplication operator).

11. What is the difference between an object and a class?
12. Suppose the classes *PartTimeEmployee* and *FullTimeEmployee* inherited the properties of the class *Employee*. What are some features that you might expect to find in each class?
13. Figure 6.2 (available from slides for the Chapter 6) provides a diagram that describes the evolution of programming paradigms. Put each of the programming languages in that diagram in the following table:

	Functional	Object-oriented	Imperative	Declarative
1950				
1960				
1970				
1980				
1990				
2000				

14. What is BNF? Explain why and how the following personal mailing address is an example of US-Post-Address BNF defined by the following diagram?

John Smith Jr.
352 Lafayette Street
Salem, MA 01970

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<postal-address> ::= <name-part> <street-address> <zip-part>

    <name-part> ::= <personal-part> <last-name> <opt-jr-part> <EOL>
                | <personal-part> <name-part>

    <personal-part> ::= <first-name> | <initial> "."

    <street-address> ::= <opt-apt-num> <house-num> <street-name> <EOL>

    <zip-part> ::= <town-name> "," <state-code> <ZIP-code> <EOL>

    <opt-jr-part> ::= "Sr." | "Jr." | <roman-numeral> | ""

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15. What is EBNF? Provide an example about EBNF.
16. Briefly describe the roles of Linker and Loader in the category of system software.