Programming language midterm examination (11/6/2001)

1. What is writability in the context of programming language? Describe the concept and give two examples on good/bad writability.

2. Describe the implementation method of Java. Is it interpreted or compiled?
   Hint: Despite that fact that Java applets can run in your browser, no matter which hardware platform you are using, does your browser support Java compilation?

3. What does it mean by that a context-free grammar is ambiguous? Give an example and explain it in details.

4. Give a general description on how to convert an extended BNF into a syntax graph. Keep in mind that in an EBNF the grammar could have optional construct, repetition, and multiple choices. Explain your construction by giving a complete example.

5. Explain the concept of the weakest precondition and give an example to explain the idea.

6. What is strong typing according to the textbook? Please indicate a feature or a mechanism such that a language becomes not strongly typed because of it.

7. Is it possible that a variable is in its scope but not in its lifetime, or vise versa? Explain your answers in details.

8. Explain the following concepts: static variables, stack-dynamic variables, explicit heap-dynamic variables, and implicit heap-dynamic variables. Give an example for each of them.

9. Describe the array address calculation in details, especially when the array has multiple dimensions. What factor should you consider in the calculation?

10. Both array and records are collection of related data. What is the fundamental difference between them?

   \[ \text{start-address} + \left( \sum_{i=1}^{m-1} \left( X_i \cdot N_i \cdot L \cdot j + X_{m-1} \right) \right) \times \text{element-size} \]

   要所写的不是 multiple dimension例子，最多3-4分