# Southeast University Examination Paper

Course Name: Principles of Compiling | Examination Term: 07-08-2(Mid) | Score:

Related Major: Computer Science &Techniques | Examination Form: Open test | Test Duration: 120 Mins

Surname_____

Student No._____

There are 6 problems in this paper. You can refer to your textbook and notebook when writing the answers in English or Chinese on the attached paper sheets.

1. Please construct context-free grammars **with ε-free productions** from the following languages (20%).

   (1) $a^{2i-1}b^{2j-1}c^{2k-1}$ ($i\geq 1, j\geq i+k, k\geq 1$)

   (2) {i|i∈N(natural number) and (i mod 5) is 0 }

2. Please construct a **DFA with minimum states** to recognize the following strings. (15%)

   {ω| ω∈(a,b,c)* and the numbers of a's and b's and c's occurred in ω are **even**, and ω **starts with b, ends with a or c**}

3. Please eliminate the left recursions (if there are) and extract maximum common left factors (if there are) from the following context free grammar, and then decide the resulted grammar is whether a LL(1) grammar by **constructing the related LL(1)**

**parsing table.**(20%)

S→I• J |I

I→I B|B

J→B J|B

B→0|1

4. Please show that the following operator grammar is whether an operator precedence grammar by **constructing the related parsing table.** (15%)

   S→a|∧|(T)

   T→T,S|S

5. Please **construct a LR(1) parsing table for the following ambiguous grammar with the additional conditions** that '•' has higher precedence than '|', '*****' has higher precedence than '•' , '*****' has higher precedence than '|', '**|**' has the property of left associative, '•' has the property of right associative.(20%)

   R→R '|' R | R•R | R* | (R) | a |b

6. Please construct **an annotated parse tree** for the input string 4+(5*6+9)*7 where the syntax-directed definition is as following (10%):

| Productions | Semantic Rules |
|---|---|
| $E \rightarrow E_1 * T$ | $E.val = E_1.val * T.val$ |
| $E \rightarrow T$ | $E.val = T.val$ |
| $T \rightarrow T_1 + F$ | $T.val = T_1.val + F.val$ |
| $T \rightarrow F$ | $T.val = F.val$ |
| $F \rightarrow (E)$ | $F.val = E.val$ |
| $F \rightarrow i$ | $F.val = i.\mathbf{lexval}$ |