

# Computer Science 330 Language Implementation

## Test Information 6.20-8.00pm Thursday 14<sup>th</sup> April 2005

### Room Eng1401 Surnames A-Z

Start reading 6.20p.m. Write your name on all sheets of your answer book. Start writing your answers at 6.30pm. Stop writing at 8.00p.m.

Remove the staple fastening the question sheets to the answer book, but do not remove the staples from the answer book. Read the questions carefully. Hand in your answer book at the front of the class. Always show your working - most marks are for showing you know what you are doing, rather than just getting the right answer. Attempt all questions. Questions total 100 marks. The test counts for 20% of the total mark.

### Question 1

**17 Marks**

Write JFlex rules to match the following tokens.

- (a) (2 marks)
- (b) (3 marks)
- (c) (7 marks)
- (d) (5 marks)

### Question 2

**63 marks**

Consider the following CUP grammar.

- (a) Using the information provided in the appendix, perform a shift-reduce LALR(1) parse of the input

...

Show both the symbols and states on the stack, the current token, and the action performed at each stage. (22 marks)

- (b) Draw the full parse tree, showing all rules used in the above shift-reduce LALR(1) parse. (8 marks)
- (c)
  - (i) Note that ... is nullable.
  - (ii) Draw the first graph, and compute the first sets for this grammar.
  - (iii) Draw the follow graph, and compute the follow sets for this grammar. (20 marks)
- (d) State ... is

Write down the set of items for goto( state ..., ... ). Make sure you take the closure.

(13 marks)

### Question 3

**20 marks**

Write a grammar to parse ..., with the specified syntax. You do not have to write any actions.

Note that this grammar is for something that you have not seen a grammar for. It is fairly straightforward so long as you design it in a top-down fashion, using appropriate rules for sequences, etc. You have to think abstractly. A good thing to understand is the grammars in the lecture notes, including the appendices.