DUBLIN CITY UNIVERSITY

SEMESTER ONE REPEAT EXAMINATIONS 2007

MODULE:	Compiler Construction 1
(Title & Code)	CA448
COURSE:	B.Sc. in Computer Applications (SE) B.Sc. in Computer Applications (CSSE) B.Sc. in Computer Applications (IS) B.Sc. in Computional Linguistics
YEAR:	4
EXAMINERS:	Dr. F. Bannister Dr. P. Gibson Dr. G. Hamilton (ext. 5017)
TIME ALLOWED:	2 Hours
INSTRUCTIONS:	Please answer ALL questions. All questions carry equal marks

Requirements for this paper
Please tick (X) as appropriate

- [ ] ***Log Table***
- [ ] ***Graph Paper***
- [ ] ***Attached Answer Sheet***
- [ ] ***Statistical Tables***
- [ ] ***Floppy Disk***
- [ ] ***Actuarial Tables***

THE USE OF PROGRAMMABLE OR TEXT STORING CALCULATORS IS EXPRESSLY FORBIDDEN

PLEASE DO NOT TURN OVER THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

1. An integer literal is defined to be a binary, octal, decimal or hexadecimal literal. A binary literal consists of the letter B followed by one or more binary digits (0, 1); e.g., B10110. An octal literal consists of the letter Q followed by one or more octal digits (0-7); e.g., Q1234567. A decimal literal consists of the letter D followed by one or more decimal digits (0-9); e.g., D1234. A hexadecimal literal consists of the letter H followed by one or more hexadecimal digits (0-9, A-F); e.g., H123ABCDEF. No integer literal should contain leading zeroes; e.g., B01 and H01D are not allowed. Express an integer literal as a regular expression. [10 marks]

2. Express an integer literal as described in question 1 as a deterministic finite automaton. [10 marks]

3. Show that the following grammar is ambiguous: [10 marks]

$S \rightarrow S = S$
$S \rightarrow a$

by giving two different parse trees for the sentence *a=a=a.*

4. Verify whether or not the following grammar is LL(1): [10 marks]

$S \rightarrow BA$
$S \rightarrow c$
$A \rightarrow bB$
$A \rightarrow cB$
$B \rightarrow a$
$B \rightarrow \varepsilon$

5. Convert the following grammar into an LL(1) grammar which recognises the same language: [10 marks]

$A \rightarrow ACy$
$A \rightarrow xB$
$B \rightarrow y$
$C \rightarrow Bx$
$C \rightarrow y$

6. Verify whether or not the following grammar is LR(0): [10 marks]

$S \rightarrow E$
$E \rightarrow id$
$E \rightarrow id\ (\ E\ )$
$E \rightarrow E + id$

7. Verify whether or not the following grammar is LR(1): [10 marks]

$S \rightarrow Aa$
$S \rightarrow Bb$
$S \rightarrow cC$
$A \rightarrow D$
$B \rightarrow D$
$C \rightarrow Ab$
$C \rightarrow Ba$
$D \rightarrow \varepsilon$

8. Verify whether or not the grammar in question 7 is LALR(1). [10 marks]

9. Consider the following grammar for floating point literals: [10 marks]

Literal → IntPart . FracPart
IntPart → IntPart Digit
IntPart → Digit
FracPart → Digit FracPart
FracPart → Digit

Add attributes and rules that calculate the real number value of a literal (hint: the only attribute that will be required for each non-terminal will be one denoting its value).

10. Construct a directed acyclic graph for the following expression which identifies all common sub-expressions: [10 marks]

(x * (y + z)) / ((y + z) * z)

[Total marks: 100]