



NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral one, Nnamdi Azikiwe Expressway, Jabi, Abuja
Faculty of Science
Computer Science Department

2024 1 EXAMINATION

PROGRAMME: B.Sc.
COURSE TITLE: Principles of Compilers and Construction
COURSE CODE: CIT316
CREDIT UNIT: 3
DURATION: 2½ HRS

Instructions: Answer Question ONE (1) and any other three questions

- 1(a) Explain the term Function Chunking. (4 marks)
- (b) List and explain three (3) loop optimization techniques (6 marks)
- (c) Mention the semantic errors that can be recognized by the semantic analysers? (5 marks)
- (d) Consider the Grammar below:
G: $E \rightarrow TE'$
 $E' \rightarrow +TE'/\epsilon$
 $T \rightarrow FT'$
 $T' \rightarrow *FT'/\epsilon$
 $F \rightarrow (E)/i$
Find FIRST(E) (6 marks)
- (e) Define target programme and give three examples. (4 marks)
- 2(a) Mention three ways of removing ambiguity from the grammar. (3 marks)
- (b) Write down the various most frequently applied transformation techniques in common optimization algorithms. (7 marks)
- (c) Outline the benefits and the drawback of LR parsing. (5 marks)
- 3(a) What is the major role and the categories of optimization within a compiler? (4 marks)
- (b) Suppose we have a grammar G:
1: $E \rightarrow E + T$
2: $E \rightarrow T$

3: $T \rightarrow T * F$

4: $T \rightarrow F$

5: $F \rightarrow (E)$

6: $F \rightarrow a$

Find the left parse of the sentence $a * (a + a)$ (10 marks)

- (c) Write the sequence of the derivation in (b) (1 mark)
- 4(a) Outline the problematic areas when considering the performance measurement of actual compilers. (5 marks)
- (b) What are the reasons for studying LR Grammars? (5 marks)
- (c) List out the steps in Lex implementation (5 marks)
- 5(a) Outline the properties provided by Optimising Compilers. (4 marks)
- (b) Given the following simple source program:
while $a < b$ do
 if $c < d$ then
 $x := y + z$
 else
 $x := y - z$
- Generate an equivalent intermediate code. (6 marks)
- (c) Write a regular expression for the regular grammar: $G = \{N, \Sigma, S, P\}$,
where $N = \{S, A\}$,
 $\Sigma = \{a, b, c\}$,
 $P = \{S \rightarrow aS, S \rightarrow bA, A \rightarrow \epsilon, A \rightarrow cA\}$ and
 S is the start symbol,
to a regular expression: (5 marks)
- 6(a) Outline the four actions adopted when implementing the shift and reduce algorithm (4 marks)
- (b) Define parse tree (3 marks)
- (c) With sample representations, describe the various types of parse trees. (8 marks)