



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**University Village, 91 Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja**  
**FACULTY OF SCIENCES**  
**COMPUTER SCIENCE DEPARTMENT**  
**2023\_1 POP EXAMINATION<sub>...</sub>**

**COURSE CODE: CIT316**

**Credit: 3 unit**

**COURSE TITLE: Principles & Techniques of Compilers/Compiler Construction**

**TIME ALLOWED: 3 Hours**

**INSTRUCTION: Answer Question 1 and any other THREE (3) Questions**

1a) To increase the compiler's portability and simplify retargeting, a typical real-world compiler usually has multiple phases, which are divided into front-end and back-end. Briefly describe each phase comprised by each division. *(10½ marks)*

b) Briefly describe the utilities provided by the operating system to execute the object code generated by the compiler. *(7 marks)*

c) Discuss Nondeterministic Finite Automaton (NFA). *(7½ marks)*

2a) Write short notes on:

i) Top-down Parsing *(3 marks)*

ii) Bottom-up Parsing *(3 marks)*

b) Differentiate between code optimization and code generation *(4 Marks)*

c) State the most difficult part of a compiler designer. *(2 Marks)*

d) State the characteristics of canonical LR parsing *(3 marks)*

3a) Consider the grammar G given below:

G:  $E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid a$

Generate the operator precedence passing table for this grammar *(9 marks)*

b) Explain the three (3) main techniques for loop optimization *(3 Marks)*

c) What are the characteristics of Simple LR parsing *(3 marks)*

4a) What are the benefits of LR Parsing? *(4 Marks)*

b) In the context of grammar, describe with examples, Terminals and Non-terminal notational convention *(8 Marks)*

c) Define Formal Grammar *(3 Marks)*

5a) Briefly describe the concept of Transition Diagram *(6 marks)*

- b) Discuss the concept of LL (K) Grammars (**6 Marks**)
- c) Explain the Dead Code Elimination Concept (**3 Marks**)
  
- 6a) Describe the operations of the following concepts:
  - i) Re-hashing (**4 Marks**)
  - ii) Chaining (**5 Marks**)
- b) How does Regular Expressions (REs) work? (**6 Marks**)