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

2024_2 EXAMINATION

PROGRAMME: **B.Sc.**
COURSE TITLE: **Principles And Techniques Of Compilers (Compiler Construction I)**
COURSE CODE: **CIT316**
CREDIT UNIT: **3**
DURATION: **2 ½ HRS**

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

1(a) Mention the operations on a string. ***(3 marks)***

(b) Given the grammar G where N={S,B}, t={a,b,c}, S is the start symbol, and P consists of the following production rules:

$$S \rightarrow aBSc$$
$$S \rightarrow abc$$
$$Ba \rightarrow aB$$
$$Bb \rightarrow bb$$

Generate three (3) valid sentences from this grammar. ***(6 marks)***

(c) Describe the various forms of intermediate codes ***(4 marks)***
(d) Identify and discuss the components of a compiler ***(6 marks)***
(e) Write down the three-address code for the following expression
a := (-c * b) + (-c * d). Before the intermediate code phase, mention the three outputs obtained from the ealier phases of the compiler (6 marks)

2(a) Differentiate between a compiler and an interpreter. ***(4 marks)***

(b) Give examples of a compiler and an interpreter. (2 marks)

(c) 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)***

3(a) What are the Criteria for Code-Improving Transformations? ***(3 marks)***

(b) In the context of grammar, describe terminals notational convention ***(8 marks)***

(c) Describe the non-terminal notational convention in context grammar (4 marks)

4(a) In a tabular form, differentiate between code optimization and code generation ***(4 marks)***

(b) What are the benefits of LR Parsing? ***(4 marks)***

(c) In code optimization design, what are the objectives of using good algorithms ***(7 marks)***

5(a) What are the roles of a typical scanner. ***(4 marks)***

(b) Calculate the first and follow functions for the given grammar

1. $S \rightarrow A\ a$
2. $A \rightarrow B\ D$
3. $B \rightarrow b$
4. $B \rightarrow \epsilon$
5. $D \rightarrow d$
6. $D \rightarrow \epsilon$

(8 marks)

(c) Explain the term Strength Reduction. ***(3 marks)***

6(a) What is a language ***(1 mark)***

(b) With a suitable diagram show the flow of the subprocesses in a compilation process. ***(9 marks)***

(c) Briefly describe the sub-processes in 6(b). ***(5 marks)***