



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**University Village, 91 Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja**  
**FACULTY OF SCIENCES**  
**COMPUTER SCIENCE DEPARTMENT**  
**2020\_1 EXAMINATIONS**

**CIT 445 – Principles & Techniques of Compilers.**

**Credit: 3 units**

**TIME ALLOWED: 2½ Hours**

**INSTRUCTION: Answer Question 1 and any other FOUR (4) Questions**

- 1a) Outline three (3) typical questions asked about formalisms. (3mks)
  - 1b) Suppose  $L_1$  and  $L_2$  are languages over some common alphabet; state two (2) standard operations that can be performed on the languages. (4mks)
  - 1c) Identify three (3) types of Intermediate Representation (3mks)
  - 1d) Why Do We Need Translators? (3mks)
  - 1e) Outline the operations of the shift-reduce parser (4mks)
  - 1f) Define finite automata. (3mks)
  - 1g) Illustrate two properties entailed in using an intermediate language representation. (2mks)
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- 2a) Examine the context-free grammar G with the productions  
$$E \rightarrow E + E \mid E * E \mid ( E ) \mid id$$
  
Generate possible leftmost derivations for  $id + id * id$  (10mks)
  - 2b) Mention the two (2) ways of resolving collision ? (2mks)
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- 3a) Consider the context-free grammar G with the productions  
$$E \rightarrow E + T \mid T$$
$$T \rightarrow T * F \mid F$$
$$F \rightarrow (E) \mid id$$
  
Generate the following:
    - i) Terminal symbols (3mks)
    - ii) Nonterminal symbols (3mks)
    - iii) Start symbol. (2mks)
  - 3b) Outline the algorithm for constructing precedence functions (4mks)
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- 4a) List and explain the components of the structure of a compiler(8mks)
  - 4b) Identify the attributes of symbol table (4 mks)

5a) Construct the Operator precedence parsing algorithm (7mks)

5b) Explain the need for lexical analyser. (5mks)

6a) Suppose we have a Grammar G:

$E \rightarrow E + T$

$E \rightarrow T$

$T \rightarrow T * F$

$T \rightarrow F$

$F \rightarrow (E)$

$F \rightarrow a$

Find the left parse of the sentence  $a^*(a+a)$  (9mks)

6b) What is Type-3: Regular Grammars (3mks)