



NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SEPTEMBER/OCTOBER 2015 EXAMINATION

SCHOOL OF SCIENCE AND TECHNOLOGY

COURSE CODE:

CIT 445

COURSE TITLE:

Principles & Techniques of Compilers

Time: 2½ hrs

Course Credit Unit: 3

Instruction: Answer any five (5) questions. Each question carries 14 marks

- 1) Define formal language) 3 marks
 - b) State three of the uses of formal languages) 3 marks
 - c) What is a translator?) 2marks
 - d) Why do we need a translator?) 3 marks
 - e) Enumerate the functions performed by the lexical analyser) 3 marks
- 2a) Briefly describe the operation performed by the shift-reduce parser) 6 marks
 - b) Given the context-free grammar G below:
$$\begin{aligned} G: \quad E &\rightarrow E + E \\ E &\rightarrow E * E \\ E &\rightarrow (E) \\ E &\rightarrow id \end{aligned}$$

State the steps performed by the shift-reduce parser when analyzing the input string:

$id_1 + id_2 * id_3$) 8 marks

- 3a) What are the benefits of LR parsing?) 4½ marks
 - b) List the common techniques for building tables for an “LR” parser stating the characteristics of each?) 6½ marks
 - c) Consider the grammar,

$$\begin{aligned} G: \quad E &\rightarrow E + T \mid T \\ T &\rightarrow T * F \mid F \\ F &\rightarrow (E) \mid i \end{aligned}$$

What is the augmented grammar for this grammar.) 3 marks

4) Consider the grammar G below:

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

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid i$

a) Generate the non-left recursive version of the grammar) 5 marks

b) Find FOLLOW of all the nonterminal symbols in the non-left recursive version of the grammar) 9 marks

5a) Explain what is meant by the term Viable Prefix?) 3 marks

b) Given the grammar G with following production rules, $S \rightarrow a \mid aS \mid bS$, determine whether the string **aababbba** can be generated by the grammar) 5marks

c) Enumerate any three of the errors which can be detected during lexical analysis) 6 marks

6) Consider the grammar,

G: $S \rightarrow a \mid aS \mid bS$

a) Find the LR(0) items for this grammar) 10 marks

b) Construct an NFA whose states are the LR(0) items from (a).) 4 marks

7) With the aid of an illustrative diagram describe the phases of a compiler.) 14 marks