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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS**

**SCHOOL OF SCIENCE AND TECHNOLOGY**

**MAY/JUNE 2012 EXAMINATION**

CIT 445 Principles & Techniques of Compilers *Time Allowed:* 2½ hrs

*Instruction:* Answer any five (5) questions

1a) Define formal Grammar. ) 4 marks

b) List and define the four basic types of grammars in the field of Computer Science ) 8 marks

c) Given the grammar *G* with following production rules, S → a | aS | bS, determine whether the string *bbaaba* can be generated by the grammar ) 2marks

2a) Define formal language ) 3 marks

b) State three of the uses of formal languages ) 3 marks

1. What is a translator? ) 2marks
2. Why do we need a translator?) 3 marks
3. Enumerate the functions performed by the lexical analyser ) 4 marks

3a) Compare interpreter and compiler ) 5 marks

b) State any five qualities of a compiler ) 5 marks

c) State the knowledge needed to build a compiler ) 4 marks

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

5) Consider the grammar G below:

G: E → E + T / T

T → T \* F / F

F → (E) / 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

6a) What are the benefits of LR parsing? ) 5 marks

1. List the common techniques for building tables for an “LR” parser stating the characteristics of each? ) 6 marks
2. Consider the grammar,

G: E → E + T | T

T → T\*F | F

F → (E) | i

What is the augmented grammar for this grammar. ) 4 marks

7) Consider the grammar,

G: S → a | aS | 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