

**CROSS RIVER UNIVERSITY OF TECHNOLOGY, CALABAR**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**FIRST SEMESTER EXAMINATIONS 2018/2019 SESSION**

**COURSE CODE: 3104**

**COURSE TITLE: COMPILER CONSTRUCTION**

**TIME: 2HRS**

**INSTRUCTION: ANSWER ANY FOUR QUESTIONS**

- 1a. The structure of a compiler is often considered to consist of the front-end and back-end. Describe the compositions and functions of each of them,
- b. Show how the sentence, a b baa b can be derived from the grammar:  
 $S = A B \mid S A B$   
 $A = a \mid a a b$   
 $B = b \mid b b a$
- 2a. Symbol table is necessary for compiler construction. Justify your statement with example.
- b. Show the derivation and parse tree for deriving  $r * (r + r * r) + ((r + r) * r)$ , given the grammar:  
 $H = A$   
 $A = A + D \mid D$   
 $D = D * N \mid N$   
 $N = (A) \mid \alpha$   
Where  $\alpha$  stands for any variable name.
- 3a. Highlight some problems encountered in programming in machine language
- b. When is a grammar said to be ambiguous? Demonstrate the ambiguity of the grammar.  
 $S = aSbS \mid bSaS$   
Using the sentence abab
- 4a. Consider the grammar  
 $S = (L) \mid a$   
 $L = L, S \mid S$   
Show parse tree for the following sentences; (i) (a,a) (ii) (a, ((a,a), (a,a)))
5. Demonstrate the ambiguity of the grammar below, by showing the derivations and parse trees for the sentence,  $x + x * x$ . Also show the derivation of the sentence,  $x + (x * x)$ .  
 $S = E$   
 $E = x$   
 $E = E + E$   
 $E = E * E$   
 $E = (E)$
- 6a. Explain the requirements and routines of the lexical analyser.
- b. Given a grammar with non-terminals, S, A, B and following productions:  
 $S \rightarrow S1 \mid AB2 \mid AB3$   
 $A \rightarrow A4 \mid 5$   
 $B \rightarrow B6 \mid e$   
Where S is the start symbol; 1, 2, 3, 4, 5 and 6 are terminals; and e is the empty string.  
(i) Derive 56231 from the grammar (ii) Show the parse tree for (i)