EDO UNIVERSITY, IYAMHO, EDO STATE
FACULTY OF SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
First Semester Examination, 2017/18 Session

Course Title: Compiler Construction **Course Code:** CMP 312
Time allowed: 2hrs **Instruction:** Answer Five (5) Questions Only **Date:** 27/04/2018

Q1.

a. Develop a simple program that can carry up to 15 lines: run and submit both the source code and the output.
b. From (a), develop a syntax tree of the source code and the associated parse tree clearly indicating the strings of tokens.
c. Justify your result in (b) with the appropriate compiler concept. **14mks**

Q2.

a. Differentiate tokens, patterns, and lexeme.
b. What is the function of a hierarchical analysis?
c. What does a semantic analysis do? **14mks**

Q3. The value of a conditional expression is either the value of *exp1* or *exp2* depending on the value of *exp0*. If *exp0* is true, then the value of the conditional expression is the value of *exp1*, and *exp2* is not evaluated. If *exp0* is false, then the value of the conditional expression is the value of *exp2*, and *exp1* is not evaluated. Assuming an abstract syntax tree for the assignment statement of the conditional expression is max = x>y ? x : y;. Describe the type checking needed in the semantics phase of the compiler to verify that there are no type errors in this assignment statement. **14mks**

Q4. The lexical- (scanner), syntactic- (parser), and semantic-analysis phases of a compiler front-end each process parts of the source program in particular ways and also check certain rules of the language being compiled.

a. If a function is called with the correct number of arguments; specify which phase of the compiler should verify this rule.
b. When an Identifier is correctly declared; specify which phase of the compiler should verify that a program conforms to that rule and why that part of the compiler is the best place for that check.
c. Where Assignment statements must end with a semicolon (;). specify which phase of the compiler should verify that a program conforms to that rule and why that part of the compiler is the best place for that check. **14mks**

Q5.Given the following CFG grammar G = ({S,A,B}, S, {a, b, x), P) with P:

a. Compute the set of LR(1) items for this grammar and the corresponding DFA.
b. Construct the corresponding LR parsing table. **14mks**

Q6. Given the grammar defined by G = ({S, A, Sign}, S, {‘,’, ‘-‘, ‘+’, ‘n’}, P) with P the set of production

a. Deduce the corresponding semantic rules associated with this grammar
b. Explain the overall operation of this syntax-directed definition and explanation which of the attributes are either synthesized or inherited.
c. Give an attributed parse tree for the source string “5,2,3-“ and evaluate the attributes in the attributed parse tree depicting the order in which the attributes need to be evaluated **14mks**

Q7. Suppose the grammar productions of a dynamically allocated language is vec_expr → id [expr]
expr → id
S → id = vec_expr
S → vec_expr = expr
Define an Syntax Directed Translation for the generation of intermediate code that computes the value of vec_expr. **14mk**