UGANDA MARTYRS UNIVERSITY

UNIVERSITY EXAMINATIONS
FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEM

END OF SEMESTER FINAL ASSESMENT

SEMESTER 2, 2022/2023

COURSE	:	**BACHELOR OF INFORMATION TECHNOLOGY, BACHELOR OF COMPUTER SCIENCE**
PAPER	:	**Compiler Design & Construction**
CODE	:	**CDC2023**
SEMESTER	:	**TWO**
DATE	:	**15/5/2023**
TIME	:	**9.30 - 12.30 PM**
DURATION	:	**3 HOURS**

Instructions

3. *Attempt All Questions in Section A and three Questions in Section B*
4. *Time Allowed 3 Hours Only*
5. *Use of relevant Illustrations/diagrams will earn you a bonus mark (s)*
6. *Remember to indicate the question number you have answered.*
7. *Write your name, course and registration number on all your answer sheets*
8. *All answers should be written on the answer booklet*
9. *All university rules apply*

Section A (25 Marks)

1. Which of the following is not correct with preprocessor functions?
   a. Macro Processing
   b. File Inclusion
   c. Language Extensions
   d. Code optimization

2. The following are some of the phases of a compiler except?
   a. Lexical analysis
   b. Syntax analysis
   c. Semantic analysis
   d. File inclusion

3. In the compiler process, every phase performs a specific role and outputs at the end of the phase, at what phase does the compiler outputs tokens, lexemes and patterns?
   a. Semantic analysis
   b. Syntax Analysis
   c. Code-optimization
   d. None of the above

4. A string of characters categorized according to the rules of a symbol refers to .....?
   a. Identifier
   b. Number
   c. Comma
   d. Tokens

5. Which of the following is not a compiler construction tool?
   a. Parser Generators
   b. Scanner Generators
   c. Data-flow Engines
   d. File inclusion

6. Which of the following languages is not statically type?
   a. C-language
   b. Java
   c. Python
   d. C#(C-Sharp)

7. Conversion of a stream of input tokens to non-terminal symbols is done by?
   a. Parser
   b. Compiler
   c. Interpreter
   d. None of the above

8. Which of the following is not a specification of tokens?
    a. Strings
    b. Language
    c. Regula Expression
    d. File Inclusion

9. A group of characters forming tokens is called?
    a. Lexeme
    b. Patterns
    c. Strings
    d. None of the above

10. Type conversion of all the data types to real data types is performed at what phase of the compiler?
    a. Lexical analysis
    b. Syntax Analysis
    c. Semantic Analysis
    d. Error Handling

Section B

1. Differentiate between the following term as they are used in compiler design (12 Marks)
   I. Static type checking and dynamic type checking
   II. NFA and DFA
   III. Name Equivalence and Structure Equivalence
   IV. Error handling and Symbol table
   V. Terminal Symbols and non-terminal symbols
   VI. To-down parser and bottom up parser

   b. The goal of static checking is to ensure that programs satisfy the semantic conditions of a language, explain atleast four examples of static checking you know. (13 Marks)

2. **a.** What is term context free grammar (CFG) in compiler design? (3 Marks)

   b. Consider the following production G = (V, T, P, S), explain the meaning of each symbol. (10 Marks)

   c. Consider the following production below, extract the semantic actions and justify your answer (6 Marks)

   S -> E$ = {printE.Val}

   d. Explain the roles of a parser in the syntax analysis phase (6 Marks)

3. Explain the meaning of the symbol table in compiler design (3 Marks)

   b. Explain the role of a symbol table in compiler design (10 Marks)

   c. The symbol table information is used by different phases of a compiler, explain how the symbol table information is used on the compiler phases below (8 Marks)
   I. Semantic Analysis
   II. Code generation
   III. Error Detection
   IV. Optimization

   d. Outline the different symbol table formats you know (4 Marks)

4. Describe the phases of a compiler(25 Marks)

5. Differentiate between the following, use examples where applicable(10 Marks);
   I. Semantic analysis and Syntax analysis
   II. Linker and loader
   III. Preprocessor and file inclusion

12 Marks)

IV. Syntax-Directed Translation and data flow engines
V. High-level optimization and low-level optimization

b. Compilation is performed in two forms which include analysis and synthesis, briefly explain the meaning of each (5 Marks)

c. Explain the meaning of the following terms as they are used in code optimization (10 Marks)

I. Constant propagations
II. Jump threading
III. Loop invariant code motion
IV. Dead code elimination
V. Strength reduction