UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

SPECIAL/SUPPLEMENTARY EXAMINATIONS

YEAR THREE SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF

BACHELOR OF COMPUTER SCIENCE

COURSE CODE : **CSC 324**

COURSE TITLE : **PRINCIPLES OF PROGRAMMING LANGUAGES**

DATE: 11/08/2023   TIME: 8:00 A.M – 10:00 A.M.

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

Question 1 (30 Marks) Compulsory

a) List and Explain the Four Programming Language Categories [4 Marks]
b) Define aliasing [1 Mark]
c) Why is readability important to writability [2 Mark]
d) Describe some design trade-offs between efficiency and safety in some language you know. [4 Marks]
e) Outline the major motivation of IBM in developing PL/I. [3 Marks]
f) Describe the two levels of uses of operational semantics. [3 Marks]
g) Prove that the following grammar is ambiguous: [3 Marks]

<S> → <A>

<A> → <A> + <A> | <id>

<id> → a | b | c

h) Describe the primary tasks of a lexical analyzer [3 Marks]
i) Why, in your opinion, do new scripting languages appear more frequently than new compiled languages? [3 Marks]
j) What significant justification is there for the -> operator in C and C++ [2 Marks]
k) Describe how does JavaScript support sparse arrays [2 Marks]

Section B: Answer any TWO questions

Question 2 (20 marks)

a) Define the following:
   i. Row major order [1 Mark]
   ii. Column major order. [1 Mark]
   iii. Descriptor [1 Mark]
   iv. heap-dynamic arrays [1 Mark]
b) Describe advantages do Java and C# reference type variables have over the pointers in other languages? [4 Marks]
c) Write a short discussion of what was lost and what was gained in Java's designers' decision to not include the pointers of C++. [4 Marks]
d) Explain the primary advantage and disadvantage of name type equivalence [4 marks]

e) Explain what advantages do Java and C# reference type variables have over the pointers in other languages **[4 Marks]**

Question 3 (20 marks)

a) Define the following:
   i.   Control structure
   ii. Block.
   iii. lexeme
   iv. Tokens   **[4 Marks]**
b) Explain the characteristic of Java that is most evident in JavaScript.   **[4 Marks]**
c) What are the design issues for counter-controlled loop statements?   **[4 Marks]**
d) Explain the characteristic that Ruby share with Smalltalk programming languages
                           [4 Marks]
e) Describe three situations where a combined counting and logical looping statement is needed.   **[4 Marks]**

Question 4 (20 marks)

a) Explain the purpose of a compound assignment operator   **[2 Marks]**
b) Explain the associativity of C's unary arithmetic operators   **[2 Marks]**
c) Describe one possible disadvantage of treating the assignment operator as if it were an arithmetic operator?   **[2 Marks]**
d) State your own arguments for and against allowing mixed-mode arithmetic expressions
                           [4 Marks]
e) What are the design issues for multiple-selection statements   **[4 Marks]**
f) Describe merits, demerits and characteristics of 3rd generation programming languages
                           [6 Marks]

Question 5 (20 marks)

a) Explain the purpose of the ACTION table of an LR parser.   **[2 Marks]**

b) Explain the purpose of the GOTO table of an LR parser.   **[2 Marks]**

c) After language design and implementation [what are the four times bindings can take place in a program?]   **[4 Marks]**

d) Describe three advantages of LR parsers.   **[6 Marks]**

e) Describe the differences between top-down and bottom-up parsers   **[6 Marks]**