LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

FOURTH YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

BICT 416: PRINCIPLES OF PROGRAMMING LANGUAGES

STREAM: R ***TIME: 2 HRS***

DAY: THURSDAY [11.30 – 13.30 P.M] ***DATE: 29/01/2026***

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

INSTRUCTIONS: Answer Question ONE and ANY other TWO Questions in Section B

SECTION A

QUESTION ONE [30 MARKS]

(a) Explain with an example (in C), the differences between parameter passing by value and parameter passing by reference. **[6 Marks]**

(b) Briefly explain the themes of imperative programming, functional programming and logic programming. **[6 Marks]**

(c) Explain the difference between syntax and semantics in programming languages. Illustrate with suitable examples. **[4 Marks]**

(d) Discuss the role of programming languages in the software development process, highlighting which phases use programming languages and why. **[5 Marks]**

(e) Briefly discuss the *Von Neumann Bottleneck*. **[5 Marks]**

(f) Explain the difference between compilers and interpreters. Discuss their relative advantages and disadvantages with respect to error detection and performance. **[4 Marks]**

SECTION B

QUESTION TWO [20 MARKS]

(a) Explain the role of **BNF and EBNF** in defining programming language syntax. Illustrate with simple grammar. **[7 Marks]**

(b) Functional programming replaces loops with recursion and function composition.

a) Explain the principles of functional programming. **[3 Marks]**

b) Write and explain a recursive definition of factorial and prime number checking in a functional programming style. **[5 Marks]**

c) Discuss the advantages and limitations of functional programming compared to imperative programming. **[5 Marks]**

QUESTION THREE [20 MARKS]

(a) Discuss the challenges in providing formal semantics for real-world programming languages **[8 Marks]**

(b) Logic programming is often said to support a declarative paradigm.

(i) Explain the difference between "*what*" and "*how*" in declarative vs imperative programming. **[4 Marks]**

(ii) Using Prolog examples, illustrate how rules and facts are used to represent knowledge. **[4 Marks]**

(iii) Discuss the challenges associated with ordering of clauses and non-termination in logic programming. **[4 Marks]**

QUESTION FOUR [20 MARKS]

(a) Provide a historical overview of how programming paradigms have evolved from procedural to modern paradigms. **[10 Marks]**

(b) Compare object-oriented, functional, and logic programming in terms of problem-solving approaches. **[10 Marks]**

QUESTION FIVE [20 MARKS]

(a) Discuss the essential qualities of a programming language: readability, writability, simplicity, safety, and robustness. **[10 Marks]**

(b) Critically analyze how **language design choices** affect software reliability and maintainability, giving examples from at least two programming languages. **[10 Marks]**