



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SECOND SEMSTER EXAMINATION FOR

BACHELOR OF SCIENCE INFORMATION TECHNOLOGY

SIT 310: FUNDAMENTALS OF PROGRAMMING LANGUAGES

DATE: 10/12/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS:

This paper consists of FIVE questions

*Answer **question one** and other **two** questions in this paper*

QUESTION ONE (30 MARKS)

- a) Briefly explain THREE major programming languages domains (3 marks)
- b) Distinguish between Backus Naur Form (BNF) and Extended Backus Naur Form (EBNF) as formalisms for representing context free grammars. (4 marks)
- c) Calculate the weakest precondition of below assignment statement (4 marks)
$$x = 2 * y - 3 \{x > 25\}$$
- d) Develop a parse tree for the statement $A = B + A * C$ (4 marks)
- e) A programming language can be formally defined in two distinct ways: by recognition and by generation. Using valid example explain each of the ways. (4 marks)
- f) Explain TWO characteristics of pure functions (4 marks)
- g) Discuss THREE aspects of language characteristics that affect writability (6 marks)
- h) Explain TWO conceptual models of how data transfers take places in parameter transmission: (4 marks)

QUESTION TWO (20 MARKS)

- a) Explain the criteria used to evaluate programming language (5 marks)
- b) Explain FOUR programming language categories (8 marks)
- c) Algol-60 provided two parameter-passing mechanisms: call-by-value and call by-name. Explain these mechanisms. (2 marks)
- d) An array is declared with 5 elements. A program is required to use an exception handler to ensure that only elements within the correct index values can be displayed, when required (5 marks)

QUESTION THREE (20 MARKS)

- a) Variables that are defined inside subprograms are called local vars, which can be either static or stack dynamic. Discuss TWO advantages and disadvantages of each (8 marks)
- b) Describe THREE sequence of operations creates a dangling pointer in programming languages (6 marks)
- c) Distinguish operational and axiomatic semantics. (4 marks)
- d) Explain the tasks performed by the push () and pop () operations of the stack (2 marks)

QUESTION FOUR (20 MARKS)

- a) Describe THREE circumstances in programming that may lead to the occurrence of an exception, giving an example of a program snippet for each of the circumstances. (6 marks)
- b) A selection statement provides the means of choosing between two or more paths of execution. Explain TWO general categories that can be applied. (4 marks)
- c) Discuss THREE benefits for studying programming languages. (6 marks)
- d) Differentiate between static type binding and dynamic type binding (4 marks)

QUESTION FIVE (20 MARKS)

- a)
 - i) A common concept used in modern programming is the principle of abstraction. Briefly explain the meaning of this principle. (2 marks)
 - ii) Outline two advantages of using abstraction in programming. (2 marks)
 - iii) Abstraction is usually illustrated better in object-oriented programming using the concept of abstract classes. Outline **FOUR** characteristics of an abstract class. (4 marks)
- b) Using an example, in a programming language of your choice, write a program that shows an implementation of an abstract class. Explain the various parts of your program. (12 marks)