KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR
SECOND YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE)

KCS 2208: PRINCIPLE OF PROGRAMMING LANGUAGES

DATE: 6TH DECEMBER 2024
TIME: 2:30PM-4:30PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE: COMPULSORY (30 MARKS)

a) A programming language is a set of instructions written by a programmer to deliver instructions to the computer to perform and accomplish a task. This set of instructions is usually viewed as incomprehensible code structured following a definite programming language syntax. In this context.

i.	Differentiate between High-level and Low-level languages	**(4 Marks)**
ii.	Discuss the parts that make up an Assembly language	**(4 Marks)**
iii.	Explain the statement 'Low level languages are not portable'	**(2 Marks)**

b) Programs are designed using common building blocks. These building blocks, known as programming constructs, form the basis for all programs. Discuss the following basic building blocks with examples.

i.	Sequence	**(4 Marks)**
ii.	Selection	**(4 Marks)**
iii.	Iteration	**(4 Marks)**

c) Programming paradigm is an approach to solve problem using some programming language or also we can say it is a method to solve a problem using tools and techniques that are available to us following some approach.

i.	Distinguish between Functional and Procedural paradigms	**(4 Marks)**
ii.	Discuss the terms Object, class, attributes and behaviors in OOP	**(4 Marks)**

QUESTION TWO: 20 MARKS

a) There are several factors to take into account when choosing the right programming language for a particular project. These factors ultimately influence the performance, maintainability, and success of your project. Highlight **FIVE** factors to consider when selecting a programming language for a project.
(10 Marks)

b) Python is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation. Write a Python program that can calculate the area and perimeter of 4 different shapes based on the user's selection at any one given time. **(10 Marks)**

QUESTION THREE:20 MARKS

a) Java is a high-level, class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible. Given the set of instructions below, convert the given set of instruction(s) below to a procedural programming paradigm following Java programming language syntax.
(10 Marks)

    1   Pour flour on a bowl
    2   Pour a couple of eggs in the same bowl
    3   Pour some milk in the same bowl
    4   Mix the ingredients
    5   Pour the mix in a mold
    6   Cook for 50 minutes
    7   Chill to serve

b) A tree is a non-linear and hierarchical data structure where the elements are arranged in a tree-like structure. In a tree, the topmost node is called the root node. Each node contains some data, and data can be of any type. It consists of a central node, structural nodes, and sub-nodes which are connected via edges. Different tree data structures allow quicker and easier access to the data as it is a non-linear data structure. With the aid of a diagram illustrate the Parent Node, child node, sibling, leaf, and levels. **(10 Marks)**

QUESTION FOUR:20 MARKS

a) Another popular approach to semantics is the operational approach (Plotkin, 1981), in which the meaning of terms is defined using an execution relation that specifies how terms can be executed in an appropriate machine model. Using the example below describe the concept of state transition, the first rule (reduction) and the second rule (congruence) of operational semantic. **(10 Marks)**

$$\frac{}{Add\,(Val\,n)\,(Val\,m)\;\longrightarrow\;Val\,(n+m)}$$

$$\frac{x\;\longrightarrow\;x'}{Add\,x\,y\;\longrightarrow\;Add\,x'\,y} \qquad\qquad \frac{y\;\longrightarrow\;y'}{Add\,x\,y\;\longrightarrow\;Add\,x\,y'}$$

b) Programming languages are mainly differentiated into two categories: high and low. Languages are categorized into these two categories based on their human level of understanding. Using a table differentiate between the two. **(10 Marks)**

QUESTION FIVE:20 MARKS

a) Hoare Logic is a formal system with a set of logical rules for reasoning vigorously about the correctness of computer programs. Here are a number of valid Hoare Triples, explain which statements are true, why and which is the most useful/strongest? **(10 Marks)**

    {x = 5} x: = x * 2 {true}
    {x = 5} x: = x * 2 {x > 0}
    {x = 5} x: = x * 2 {x = 10 || x = 5}
    {x = 5} x: = x * 2 {x = 10}

b) Data types play a critical role in a wide range of real-life applications. Understanding which data types to choose for specific tasks and challenges can significantly improve your problem-solving and programming skills. Discuss 5 data types. **(10 Marks)**