



Kasarani Campus
Off Thika Road
P. O. Box 49274, 00101
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

**KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2022/2023 ACADEMIC YEAR
SECOND YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF BUSINESS AND
INFORMATION TECHNOLOGY**

KBI 2202 - DATA STRUCTURES AND ALGORITHMS

Date: 9th December, 2022
Time: 8.30am – 10.30am

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE - (30 MARKS)

- a) Write the output of the following stack **(14 marks)**
- Push (1)
 - Push (2)
 - Push (3)
 - Pop ()
 - Pop ()
 - Push (4)
 - Push (5)
 - Top ()
 - Pop ()
 - Pop ()
 - Pop ()
 - Pop ()
 - Top ()
 - Push (6)
- b) Design an algorithm to find the average of six numbers where the sum of the numbers is already given **(5marks)**
- c) Explain the **Five** methods used in queues. **(5marks)**
- d) Briefly explain **Six** desirable features of an algorithm **(6 marks)**

QUESTION TWO (20 MARKS)

- a) Encapsulation is one of the key principles of object orientation that aids the software designer by enforcing information hiding. Objects encapsulate data and the procedures for manipulating that data by hiding the details of the implementation from the user of that object. Explain any other five principles. (10 marks)
- b) Write a C++ program that will allow input of an array of an unsorted numbers then displays the sorted array in ascending order. (10 marks)

QUESTION THREE (20 MARKS)

- a) Differentiate between procedural abstraction and data abstraction with regard to data structures (5 marks)
- b) Explain how an element is inserted at the head of a singly linked list (5 marks)
- c) Draw a flowchart that displays the largest number in a set of many numbers (7 marks)
- d) Describe THREE areas in which stacks are applied extensively in the real world (3 marks)

QUESTION FOUR (20MARKS)

- a) With the use of relevant examples, distinguish between the standard queue, priority queue and the double-ended queue (9 marks)
- b) Write a C++ program that will allow the user to input the salaries of employees then display the employees whose salaries are greater than KES50000. Ensure to use arrays in your program. (11marks)

QUESTION FIVE (20 MARKS)

- a) Outline the workings of the bubble sort algorithm (6 marks)
- b) Convert the following expressions to prefix and postfix. (6 marks)
 $(((A + B) * C) - D) / F$
- c) What is the difference between a linear search and a binary search (4 marks)
- d) Discuss the greedy algorithm (4 marks)