UGANDA MARTYRS UNIVERSITY
NKOZI

UNIVERSITY EXAMINATIONS

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION SYSTEMS
END OF SEMESTER I   EXAMS

SECOND YEAR EXAMINATION FOR BACHELOR OF INFORMATION TECHNOLOGY, GENERAL, COMPUTER SCIENCE & EDUCATION
Programming Data Structures and Algorithms
CSC2103

DATE: 14 th DECEMBER 2023 TIME:9:30 TO 12:30 PM
DURATION: 3HRS

Instructions:

1. *Carefully read through ALL the questions before attempting*

2. ***Answer ANY 8 Questions***

3. *No **names** should be written anywhere on the examination book.*
4. *Ensure that your **Reg number** is indicated on all pages of the examination answer booklet.*
5. *Ensure your work is **clear** and **readable**. Untidy work shall be penalized*
6. *Any type of examination Malpractice will lead to automatic disqualification*
7. *Do not write anything on the question paper.*

Qn1. Explain the following terminologies

    a. Algorithm
    b. Data
    c. entity
    d. Group data item
    e) Record

                                                   (10 Marks)

Qn2. a) State the two main categories of data structures
    b) Write about any   three data structures.

                                                   (10 Marks)

Qn3. Data stored in data structures is processed through special operations, explain any 5 data structure operations. (10 Marks)

Qn4. Write an algorithm and its corresponding flow diagram for inserting an element "cooking oil" in the Kth location of a non-empty array Products containing N products. (10 Marks)

Qn5. Arithmetic expressions could be written using the infix, prefix and postfix notations, with clear examples write about the above notations.

(10 Marks)

Qn6. By inspection and hand translate the following expressions from infix to postfix
   i) f / g   ii) j * k ^ s+ m / n
   By inspection and hand translate the following expressions from prefix to infix
   i) * 4,8   ii) + *6,9 -5,7   (10 Marks)

Qn7. Given the expression E: 4 + 3^ 2+ 3 * 5

   With the help of the stack:
   a). Convert E from infix to its equivalent postfix expression P   (5 Marks)
   b). Evaluate the following postfix expression K: 4,2*8,6 - +   (5Marks)

Qn8. Given the following expression w: d* s + c ^d
   a)   Give the tree T representation of the above expression W.
   b)   Give the preorder Traversal of T
   c)   Give the postorder Traversal of T.   (10 Marks)

Qn9. Given the following prefix expression H: * / a d+ x y

   a) Give the tree T representation of the above prefix expression H.
   b) State all the left successors in T.
   c) State all the leaves in T
   d) State the depth or height of the tree T.
   e) Give the link representation of the tree T.   (10 Marks)