



MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

**FACULTY OF ENGINEERING, APPLIED SCIENCES AND
TECHNOLOGY**

DEPARTMENT: COMPUTER SCIENCE AND INFORMATION SYSTEMS

MODULE: DATA STRUCTURES AND ALGORITHMS

CODE: BCOS122

**SESSIONAL EXAMINATIONS
DECEMBER 2023**

DURATION: 3 HOURS

EXAMINER: Dr C. KURANGA

INSTRUCTIONS

- 1. Answer **any four** questions*
- 2. Each question carries 25 marks*
- 3. Start a new question on a fresh page*

Additional material(s): None

Question 1

- a) Explore *two* fundamental concerns addressed by a data structure. [4]
- b) Discuss the classification of data structures. [8]
- c) Explain any five operations that can be applied to a linear data structure. [5]
- d) Describe how the binary search algorithm performs a search on the following data:
11, 22, 30, 33, 40, 44, 50, 60, 66, 77, 80, 88, 89 [8]

Question 2

- a) Explore the applications of binary trees. [5]
- b) Construct an expression tree for the expression $(a + b * c) + ((d * e + 1) * g)$.
Give the outputs when you apply *preorder*, *inorder* and *postorder* traversals. [9]
- c) Outline the use of Dijkstra's algorithm. [5]
- d) Describe a minimum cost spanning tree. [6]

Question 3

- a) Compare and contrast an array and a linked list. [10]
- b) Discuss queue operations using arrays. [6]
- c) Differentiate between a sequential file and an index sequential file. Outline the benefits of each file. [9]

Question 4

- a) Write the routine to insert an element onto a queue. [8]
- b) Differentiate between a recursion and an iteration. [8]
- c) Outline the steps involved in deleting a node from a binary search tree. [9]

Question 5

- a) Convert the infix $(a+b)*(c+d)/f$ into *postfix* and *prefix* expression. [6]
- b) Explore the features of a stack. [5]
- c) Explain the usage of a stack in recursive algorithm implementation. [5]
- d) Describe how a queue is implemented by a linked list. [9]

Question 6

- a) Compare and contrast a closed hashing and an open hashing. [8]
- b) Discuss a breadth-first traversal for a graph. [6]
- c) Explore steps needed to traverse a list. [3]
- d) Explain a stack data structure. [8]

END OF EXAMINATION