MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2024/2025 ACADEMIC YEAR

SECOND YEAR **FIRST** SEMESTER EXAMINATION FOR BACHELOR OF BCS, BCT, BIT, BSE, BBIT

SCS 200- DATA STRUCTURE AND ALGORITHM

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question ONE and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

(a) Define following terms as used in computing:

i. Abstract data type (ADT) (2 marks)

ii. Binary tree (2 marks)

iii. Graph (2 marks)

iv. Stack overflow (2 marks)

v. Algorithm (2 marks)

(b) Using a flow chart represent the algorithm a pop operation in a stack. (3 marks)

(c) Discuss the searching problem and briefly explain any two searching approaches. (4 marks)

(d) Explain the differences an array and a linked list. (3 marks)

(e) Given the following array of numbers (45,23,78,12,89,15) demonstrate how selection sort algorithm would sort this array in ascending order. (6 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a) Describe the following types of linked lists:

i. Singly linked list (2 marks)

ii. Doubly linked list (2 marks)

iii. Circular linked list (2 marks

b) Study the tree diagram below and perform the following traversals; (ATTACHMENT ONE)

i. Preorder traversal (3 marks)

ii. In order traversal (3 marks)

iii. Postorder traversal (3 marks)

c) By the use of a relevant example, explain how heap sort works. (5 marks)

QUESTION THREE (20 MARKS)

a) Discuss the concept of the queue ADT and write pseudocode for the initialization enqueue and dequeue operation on a queue. (7 marks)

b) Explain how a priority queue differs from a normal queue and describe an application where a priority queue is used. (3 marks)

c) Given the following weighted answer the following (ATTACHMENT TWO)

i. Write the algorithm for KRUSKAL algorithm for finding minimum cost. (3 marks)

ii. Write the algorithm for PRIMS Algorithm for funding minimum cost tree. (3 marks)

iii. Find the minimum spanning tree citing path to follow for KRUSKAL & PRIMS Algorithm. (4 marks)

QUESTION FOUR (20 MARKS)

a) Given the following integers [57,85,35,9,47,20,26,99,93,10] construct a binary search tree [BST] by inserting the numbers one at a time, starting with 57 and ending with 10… (7 marks)

b) Define the sorting problem and write an algorithm to implement the merge sort technique (5 marks)

c) Discuss graph traversal algorithms specifically bread first search (BFS) and depth first search (DFS). (8 marks)