



ZIMBABWE EZEKIEL GUTI UNIVERSITY

FACULTY OF SCIENCE, TECHNOLOGY, AGRICULTURE AND FOOD SYSTEMS
DEVELOPMENT

DEPARTMENT OF INFORMATION SYSTEMS

EXAMINATION PAPER

COURSE CODE : BIS123
COURSE TITLE : Data Structures and Algorithms
SPECIAL REQUIREMENTS : None
DURATION : 3 Hours
LEVEL : 1.1/1.2
DATE : 23 SEP 2025

INSTRUCTIONS TO CANDIDATES:

1. Answer **five** questions
2. Start each Question on a new page
3. Use C, C++, C#, Java or Python for code.

Question 1

a) Draw the directed graph that corresponds to this adjacency matrix:

	0	1	2	3	
0	true	false	true	false	
1	true	false	false	false	
2	false	false	false	true	
3	true	false	true	false	

[10 marks]

b) Draw the edge lists that correspond to the graph from the previous question.

[10 marks]

Question 2

a) Write the pseudocode for the merge sort algorithm.

[10 marks]

b) Explain why the bubble sort algorithm is less efficient compared to the insertion sort algorithm

[10 marks]

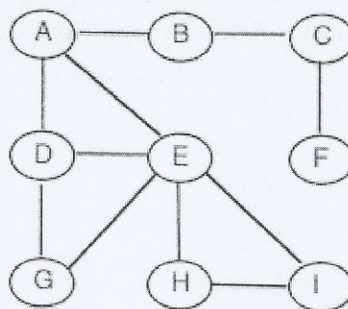
Question 3

a) State the order in which the vertices of the graph below will be traversed when the edges incident on a vertex are traversed by the alphabetic order of the adjacent vertices, and each of the following traversal algorithms is used. Start from node A.

i) Depth-First Traversal (DFT)

ii) Breadth-First Traversal (BFT)

[10 marks]



Describe the various operations performed on a queue data structure

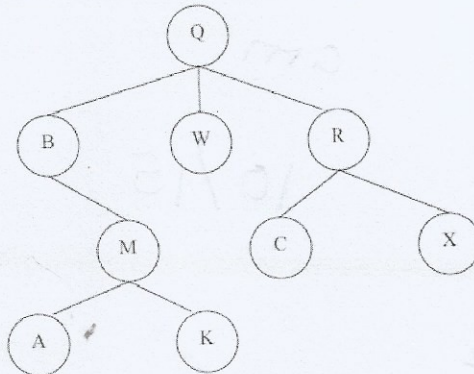
[10 marks]

Question 4

- a) Explain what is meant by the following algorithm analysis terms and show how they are represented in asymptotic terms.
- i) Worst case scenario
 - ii) Best case scenario
 - iii) Average case scenario
- [9 marks]
- b) Explain why algorithm analysis is important [10 marks]

Question 5

- a) Draw the binary search tree that is created if the following numbers are inserted in the tree in the given order. **12 15 3 35 21 42 1** [8 marks]
- b) Draw a balanced binary search tree containing the same numbers [8 marks]
- c) Consider the following tree, which is not a binary tree



- i) Which node(s) is(are) the roots of this tree? [1 mark]
- ii) Which node(s) is(are) the leaves of this tree? [3 marks]

END