

Handwritten signature in red ink.



(Knowledge for Development)

KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
YEAR TWO SEMESTER ONE EXAMINATIONS**

**FOR THE DEGREE OF
BACHELOR OF SCIENCE COMPUTER
SCIENCE**

**COURSE CODE : CSC 225
COURSE TITLE : DATA STRUCTURES**

DATE: 18/04/2023

TIME: 9.00AM-11AM

INSTRUCTIONS TO CANDIDATES

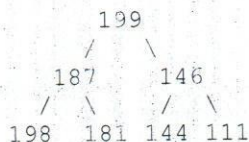
ANSWER QUESTIONS ONE AND ANY OTHER TWO.

- b) Write the correct algorithm so that it outputs unbalanced only if the sequence is unbalanced and hence translate the algorithm into a static method. Write the method main to test your method. [8 marks]

QUESTION 3

(20 marks)

- a) State with reasons whether the following binary tree is a heap structure or not: [3 marks]



- b) Draw an expression tree for the expression $(90 + 40) * 50 + (40 - (60 - 30))$. [4 marks]
 c) Generate the postfix expression from the expression tree in question (b) above and evaluate the expression [4 marks]
 d) Give the output of the three traversal orders of the generated expression tree. [3 marks]
 e) Draw the binary search tree that results from adding the following integers (134, 145, 13, 187, 165, 132, 11, 112, 117). [4 marks]
 f) What problem does binary search tree suffer from? [2 marks]

Question 4

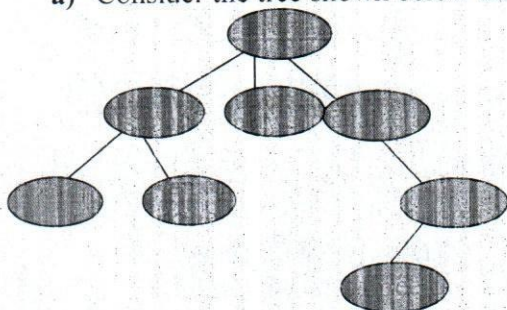
(20 marks)

- a) What is a hash table? [2 marks]
 b) Distinguish between a table and a record. [2 marks]
 c) Briefly describe any three collision resolution algorithms for hash tables highlighting any disadvantages that may exist. [6 marks]
 d) A parking lot has 31 visitor spaces, numbered from 0 to 30. Visitors are assigned parking spaces using the hashing function $h(k) = k \bmod 31$, where k is the number formed from the first three digits on a visitor's license plate.
 i. Which spaces are assigned by the hashing function to cars that have these first three digits on their license plates: 317, 918, 007, 100, 111, and 310? [7 marks]
 ii. Describe a procedure visitors should follow to find a free parking space, when the space they are assigned is occupied. [3 marks]

Question 5

(20 marks)

- a) Consider the tree shown below the table that follows: [6 marks]



NODE	DEPTH	HEIGHT	LEVEL
A			
B			
C			
F			
H			

- b) Write the Java code to represent the class Node used to represent a binary tree. The data part of the node should hold elements of type Object. Include in your class, a no-parameter constructor with appropriate initialization. **[7 marks]**
- c) Design a tree class that uses the node class above. Include in your tree class a reference to the root, a no-argument constructor, insert method which inserts a given method into the tree, and traverse method which traverses the tree starting from the root. **[7 marks]**