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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2022/2023 ACADEMIC YEAR
SECOND YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF BUSINESS AND INFORMATION
TECHNOLOGY

Date: 1st August, 2022
Time: 8.30am –10.30am

KBI 2202 - DATA STRUCTURES AND ALGORITHMS

INSTRUCTIONS TO CANDIDATES

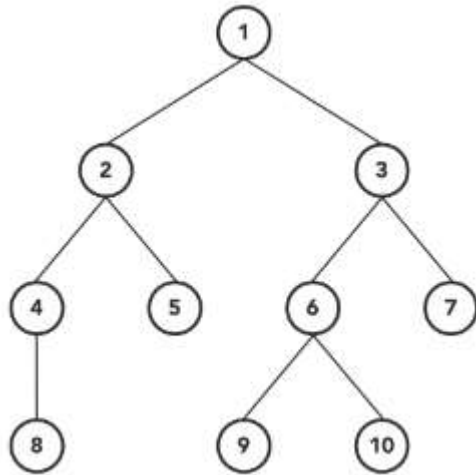
ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

- a) The pop () operation in the stack ADT returns a stack, while the pop () operation in the stack interface returns a value of type T. Why are these so different? (4 marks)
- b) Distinguish the following: (6 marks)
- i) primitive and standard data types
 - ii) binary search and linear search
 - iii) Tree and Graph (6 marks)
- c) Explain any three components that can be used in the greedy algorithm: (6 marks)
- d) There are two types of deque, using illustrations discuss them. (6 marks)
- e) Suppose the following list of numbers is inserted in order into an empty binary search tree: 45,32,90,34,68,72,15,24,30,66,11,50,10
- i) Construct the binary search tree (4 marks)
 - ii) Find the in-order, pre-order and post-order traversal of BST created. (4 marks)

QUESTION TWO (20 MARKS)

- a) Traverse the given tree using the various ways mentioned below indicating your answers for each. Draw the tree indicating your traverse and the final output.



- i) Inorder :
 - ii) Preorder:
 - iii) Postorder:
 - iv) Level Order: (8 marks)
- b) With an illustration, briefly describe a flowchart and its importance in algorithm presentation (6 marks)
- c) With an aid of a diagram Divide-and-Conquer method. (6 marks)

QUESTION THREE (20 MARKS)

- a) There are two types of priority queue, discuss them showing an example of how they are presented: (8 marks)
- b) Write a C/C++ program to calculate the average of a set of numbers. (6 marks)
- c) Define the following efficiency measures of an algorithm
- i) Best Case
 - ii) Average Case
 - iii) Worst Case
- (6 marks)

QUESTION FOUR (20 MARKS)

- a) Write a **recursive function** that takes a positive number n as its parameter and returns the nth Fibonacci number (5 marks)
- b) Define (with diagram/example) 'Sibling' and 'Height of Tree'. (8 marks)
- c) Showing your working, Convert the following expressions to prefix and postfix. (7 marks)
- $(((A + B) * C) - D) / F$

QUESTION FIVE (20 MARKS)

- a) Convert the following expressions to prefix and postfix, show your workings
 $((P + ((Q \wedge R) - S)) * (U - (P / R)))$
(8 marks)
- b) Suppose an initially empty stack S has performed a total of 25 push operations, 12 top operations, and 10 pop operations, 3 of which returned null to indicate an empty stack. What is the current size of S?
(4 marks)
- c) Suppose an initially empty queue Q has performed a total of 32 enqueue operations, 10 first operations, and 15 dequeue operations, 5 of which returned null to indicate an empty queue. What is the current size of Q?
(4 marks)
- d) Briefly outline the workings of the bubble sort algorithm. Illustrate your answer. (4 marks)