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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
SECOND YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF BUSINESS INFORMATION TECHNOLOGY
KBI 2202 – DATA STRUCTURES AND ALGORITHMS

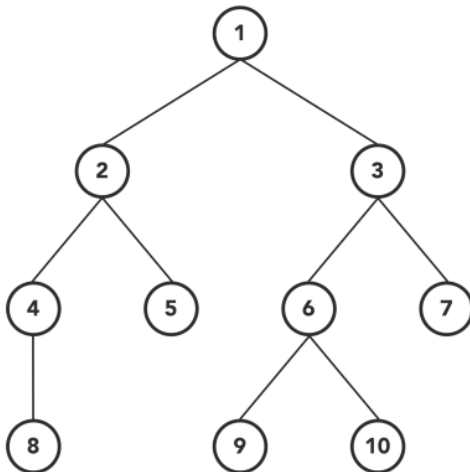
Date: 14TH December 2023
Time: 8:30AM – 10:30AM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

- a) 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. Showing your workings, What is the current size of Q? (4 Marks)
- b) There are two types of priority queue, discuss them showing an example of how they are presented: (6 Marks)
- c) Using various ways as indicated below while indicating your answers for each, Traverse the given tree. Draw the tree indicating your traverse and the final output for each. (6 Marks)



- i) Inorder :
ii) Preorder:
iii) Postorder:
- d) Differentiate between 'Sibling' and 'Height of Tree' with the aid of illustrations. (6 Marks)
- e) Showing your working, Convert the following expressions to postfix. (4 Marks)
 $(((A + B) * C) - D) / F$
- f) Define the following terms
- i) Data Structures (2 Marks)
ii) Algorithms (2 Marks)

QUESTION TWO (20 MARKS)

- a) Briefly outline the workings of the bubble sort algorithm. Illustrate your answer. (4 Marks)
- b) There are two types of deque, using illustrations discuss them. (8 Marks)
- c) Convert the following expressions to prefix and postfix, show your workings (8 Marks)
- $$((P + ((Q \wedge R) - S)) * (U - (P / R)))$$

QUESTION THREE (20 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) Using suitable examples explain four types of linked lists (8 Marks)
- c) Distinguish between primitive and standard data types as used in data structures. (4 Marks)
- d) Explain any two properties of an array as illustrated in data structures (4 Marks)

QUESTION FOUR (20 MARKS)

- a) Distinguish between the Analysis of algorithm and complexity of algorithm giving examples (6 Marks)

- b) Study the pseudo code below:

Start

Declare variables profit, cost, loss, sellprice

Get value of cost and sellprice

IF cost>sell_price

Loss=cost-sellprice

ELSE IF sell_price>cost

Profit=sellprice-cost

ELSE

Display “no profit nor loss”

END IF

Stop

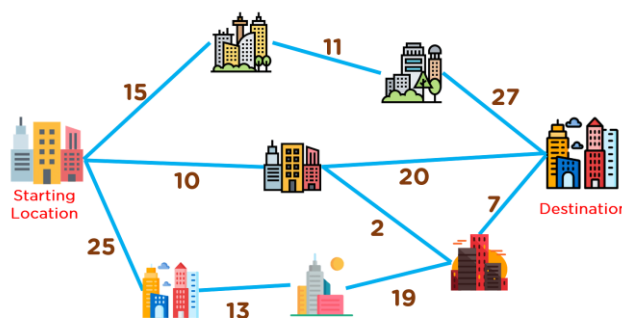
Required: Use test values sellprice=4000 and cost=5000 to perform a dry run for this pseudocode.

(8 Marks)

- c) Find the best route to reach the destination city from the given starting point using a greedy method.

Show your workings.

(6 Marks)



QUESTION FIVE (20 MARKS)

- a) Demonstrate four operations of a stack as used in Data Structures. (8 Marks)
- b) The following is a list created by a student during a Data Structures and Algorithm class. Use it to answer the question that follows.

List = {32, 43, 29, 46, 67, 59, 71, 14}

Write the output when each of the following operations are carried out on the list.

i. Head(Tail)(Tail)(List)

ii. Empty(List)

(6 Marks)

- c) Explain three types of time complexity.

(6 Marks)