

**BOWEN UNIVERSITY, IWO**

**COLLEGE OF COMPUTING AND COMMUNICATION STUDIES**

**COMPUTER SCIENCE PROGRAMME**

**B.Sc. DEGREE SECOND SEMESTER EXAMINATION 2022/2023 SESSION**

**COURSE CODE: SEN 208**

**COURSE TITLE: ALGORITHM DESIGN**

**COURSE CREDIT: 2**

**TIME: 2 HOURS**

**INSTRUCTION: Answer 3 questions only**

**QUESTION ONE**

- a. Using insertion sort algorithm to sort the list 76, 32, 43, 10, 87, 21, 65, 54. All details should be shown (8 marks)
- b. Using quick sort algorithm, sort the list 20, 3, 9, 53, 75, 88, 38, 58, 97, 42, 87, 64. All details should be shown (10 marks)
- c. DATA is an array with N elements, write a linear search algorithm that sort the element in DATA (4 marks)
- d. Discuss the complexity of the algorithm in C (3 marks)

**QUESTION TWO**

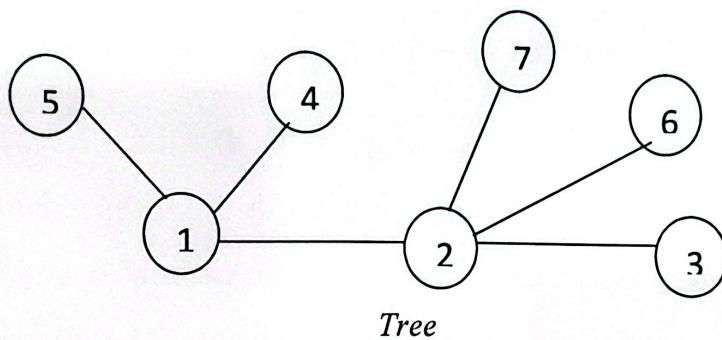
Define the following Terms:

- a. (i) siblings (ii) Leaf (iii) Binary Tree (iv) Level (1 mark each)
- b. What are the properties of a binary tree. (5 marks)
- c. Discuss the concept of asymptotic functions as a major tool in analysing the complexity of algorithms. (graphical illustration is required.) (15 marks)

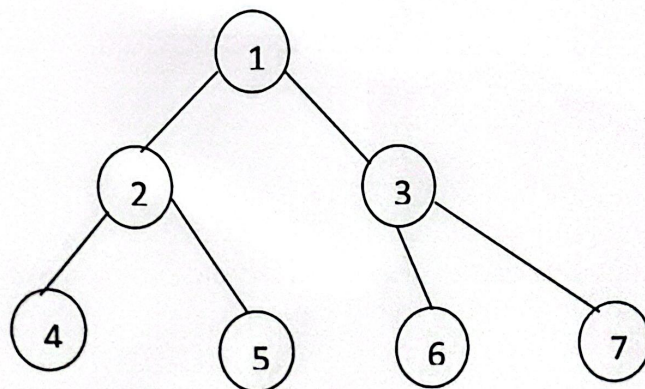
### QUESTION THREE

- Explain the principle of operation of binary search algorithm?
- Use a binary search algorithm to search for the element in the list

### QUESTION FOUR



Depth



- Produce the (i) Breadth First Search (ii) Depth First Search of each of the trees above ( 4 marks each = 8 marks)

- a. In string processing, a text T and a pattern P are in memory. Write an algorithm that:
- (i) delete every occurrence of P in T **(9 marks)**
  - (ii) Replace every occurrence of P in T by Q **(8 marks)**
- b.

### QUESTION FIVE

- c. One of the rules of designing a game is explained as follows:

First, we examine the starting mode A. Then we examine each node N along a path P which begins at A i.e. we process a neighbour of A, then a neighbour of a neighbour A and so on. After coming to a dead end we backtrack on P until we can continue along another path  $P^i$  and so on. Write a Breath first search algorithm to implement the rule. **(10 marks)**

- d. Solve the following recurrence relation assuming  $n=2^k$

$$C(n) = 2, n = 2$$

$$= 2.C(n/2) + 3, n > 2 \quad \textbf{(6 marks)}$$

- b. Enumerate the various steps involved in the execution of Dijkstra's algorithm **(9 marks)**