Reg. No.

AANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (COMPUTER SCIENCE AND ENGINEERING) GRADE IMPROVEMENT/MAKEUP EXAMINATIONS, AUG 2021 SUBJECT: DESIGN AND ANALYSIS OF ALGORITHM [CSE 2252] REVISED CREDIT SYSTEM (06/08/2021)

Time: 2 Hours

MAX. MARKS: 40

Instructions to Candidates:

- ✤ Answer ANY FOUR FULL questions.
- ✤ Missing data may be suitably assumed.
- **1A.** Explain in detail, the following data structures which play critical role in design and analysis of algorithm.
 - a) Graphs b)Sets and dictionaries
- **1B.** Consider the following recursive algorithm

Algorithm *Search* A[0...n-1]

// input : An array A[0 ... n-1] of real numbers

if n==1 return A[0]

else temp < search(A[0 ... n-2])

If temp \geq A[n-1] return temp

else return A[n-1]

- a) What does algorithm compute?
- b) Explain the general plan for analyzing the efficiency of the recursive algorithm given above.
- **2A.** For each of the following algorithms, indicate (i) a natural size metric for its inputs, (ii) its basic operation, and (iii) whether the basic operation count can be different for inputs of the same size:

a. computing n!

- b. finding the largest element in a list of n numbers
- c. Euclid's algorithm
- d. sieve of Eratosthenes
- e. pen-and-pencil algorithm for multiplying two n-digit decimal integers
- 2B. Sort the list M,A,L,A,Y,A,L,A,M, in alphabetical order by selection sort. Show all the steps. Write the selection sort algorithm and analyze the algorithm.5M
- **3A.** For the following list of elements, construct an AVL tree by inserting the following elements **5M**

5M

5M

successively, starting with the empty tree.

14,17,11,7,53,4,13,12,8,60,19,16,20

- **3B.** Construct a 2-3 tree for the list 50,30,75,25,20,10,15 by inserting the elements successively starting with the empty tree.
- **4A.** Construct MAX Heap Tree for the given list of elements 25,23,32,20,14,19,27,34,26,21,9. Also, sort the elements using Heapsort.
- **4B.** Discuss how the technique of input enhancement can be applied to the problem of string matching. Also, explain how pattern matching is done using Horspool's String matching algorithm with the help of an example.
- **5A.** Consider the graph



Write the adjacency matrix and adjacency list of the graph. Starting at vertex a and resolving ties by the vertex alphabetical order, traverse the graph by breadth-first search and construct the corresponding breadth-first search tree clearly representing the tree and cross edges. **5M**

- **5B.** Write the iterative DFS algorithm. What does PUSH and POP functions accomplish in the iterative DFS algorithm.
- **6A.** Write insertion sort algorithm and derive its worst and best case time complexity. **5M**
- **6B.** Apply quicksort to sort the below list in alphabetical order. Draw the tree of the recursive calls made.

5M

5M

5M

5M

5M