

SIC No.-

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Duration: 01:30

Total No. of Page:-01

Full Marks: 25

1 Answer All

- a Define the asymptotic notation theta(Θ) 1
- b Order the following functions by decreasing order of asymptotic growth:
 n^2 , $2^{\lg n}$, $\lg(n!)$, 100000, n^3 , $n \lg n$ 1
- c What is the running time of the following code segment: 1
`int a = 0, i = N;
while (i > 0)
{
 a += i;
 i /= 2;
}`
- d what is asymptotic tight bound of BUILDMAXHEAP() procedure? 1
- e What are the differences between Dynamic Programming and Divide and Conquer paradigm? 1
- f What are the minimum and maximum number of elements in a heap of height h? 1

2 Answer any Three

- a Solve recurrence relation: 3
 $T(n) = 2T(\sqrt{n}) + \lg n$
- b Solve the following recurrence : $T(n) = 3T(n/4) + n^2$ 3
- c Explain the HEAP-INCREASE-KEY operation of the priority queue using heap with a suitable example and find out its time complexity? 3
- d Show that any comparison based sorting algorithm requires $\Omega(n \lg n)$ comparisons in worst case to sort n elements. 3

3 Answer any One

- a Write down the algorithm for MERGE-SORT and MERGE procedure. Show that the running time of merge sort is $O(n \lg n)$. 5
- b Write down the algorithms for QUICK-SORT and PARTITION procedure. Find the best case and worst case time of QUICK-SORT. 5

4 Answer any One

- a Write the MAX-HEAPIFY(A, i) algorithm and show that the running time of MAX-HEAPIFY on a subtree of size n rooted at a given node i is $O(\lg n)$ 5
- b Determine an LCS of $\langle 1, 0, 0, 1, 0, 1, 0, 1 \rangle$ and $\langle 0, 1, 0, 1, 1, 0, 1, 1, 0 \rangle$ using the tabular method of Dynamic Programming 5