



Duration: 01:30

Total No. of Pages:-01

Full Marks: 25

1 Answer All

- a Sort the following functions on n in ascending order of their rate of growth: _____ 1
 $4 \lg n$, 2^n , n , n^2 , $\lg n$, $10^5 n$, $n^2 \lg n$, $\lg(n!)$, $n!$, n^n
- b Discuss when Master method fails to solve a recurrence relation of the form $T(n) = a T(n/b) + f(n)$, with $a \geq 1$ and $b > 1$. 1
- c Justify your answer: Is $2^{2n} = O(2^n)$? 1
- d Define the asymptotic notation Big-O. Discuss how it is different from little-o. 1
- e Is an array that is sorted in non-decreasing order form a MIN-HEAP? Is the converse true? 1
- f Write the differences of Dynamic Programming and Divide and Conquer paradigm. 1

2 Answer any Three

- a Solve recurrence relation: $T(n) = T(n-1) + \lg n$ 3
- b Show that $(\lg n)^k = o(n)$ for any positive integer k . 3
- c Write the BUILDMAXHEAP() procedure and show that asymptotic tight bound of the procedure is $O(n)$. 3
- d Write the MERGE function used in MERGE-SORT algorithm and find its time complexity. 3

3 Answer any One

- a Write the algorithms for QUICK-SORT and PARTITION procedure. Write the the best case and worst case recurrence relation and solve them to find the time complexity. 5
- b Solve the recurrence relation:
 $T(n) = 2T(n/2) + n \lg n$. 5

4 Answer any One

- a Determine an LCS of $X = \{A, B, C, B, D, A, B\}$ and $Y = \{B, D, C, A, B, A\}$ using tabular method of Dynamic Programming. 5
- b Write the algorithm for HEAP-INSERT, HEAP-EXTRACT_MAX and HEAP-INCREASE-KEY operation of a Max-Priority Queue and find their time complexity. 5
Illustrate HEAP-INCREASE-KEY OPERATION to increase the key at node number 10 to 25 in the following MAX-PRIORITY QUEUE:

