Silicon Institute of Technology
Silicon Hills, Bhubaneswar
| An Autonomous Institute |

4th Semester B.Tech. Mid Term Examination 2021-22
DESIGN & ANALYSIS OF ALGORITHMS(BTCS-T-PC-011)

Duration: 01:30 Full Marks: 25

1 ***Answer All***

a Write the recurrence equation for the worst case behaviour QUICK sort. 1

b Show that $\sum_{i=0}^{n} i = \theta(n^2)$ 1

c Order the following functions by decreasing order of asymptotic growth: 1
n^2, $2^{\lg n}$, lg (n!), 100000, n^3, n lg n

d Is an array that is in sorted order a min heap? 1

e In the array representation of an n-element MIN-HEAP what is the index of first leaf node? 1

f Working modulo q=11, how many spurious hits does the Rabin-Karp matcher encounter in the text T=31415926 when looking for the pattern P=26. 1

2 ***Answer any Three***

a Explain the Divide-and-Conquer technique. Design a recursive algorithm for Binary Search. 3

b Solve the following recurrence: 3
$$T(n) = 7T\left(\frac{n}{2}\right) + n^2$$

c Explain the HEAP-INCREASE-KEY operation of the priority queue using heap with a suitable example and find its time complexity? 3

d Illustrate the operation of MAX-HEAPIFY(A, 3) on the array A=<27, 17, 3, 16, 13, 10, 1, 5, 7, 12, 4, 8, 9, 10>. 3

3 ***Answer any One***

a Illustrate the operation of PARTITION on the array A = <13, 19, 9, 5, 12, 8, 7, 4, 11, 2, 6, 21>. 5
Show that the running time of QUICKSORT is $\theta(n^2)$ when the array A contains distinct elements and is sorted in decreasing order.

b Write down the algorithm for MERGE-SORT and MERGE procedure. Show that the running time of merge sort is O (n lg n). 5

4 ***Answer any One***

a Find the optimal parenthesization of matrix-chain product whose sequence of dimension is <5, 10, 3, 12, 5, 50, 6>. 5

b Find the LCS from the given sequences X = {A, B, C, B, D, A, B} and Y = {B, D, C, A, B, A} using tabular method of Dynamic Programming. 5