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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- February 2019

B.Tech IV<sup>th</sup> Semester

COURSE CODE: 10B11CI411

MAX. MARKS:15

COURSE NAME: Fundamentals of Algorithms

COURSE CREDITS: 04

MAX. TIME: One Hr

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

1. [CO-2] Solve the recurrence relation: [3 Marks]

$$T(1) = 1, T(2) = 6, \text{ and for all } n \geq 3,$$

$$T(n) = T(n-2) + 3n + 4$$

2. [CO-3] Prove that the best case and worst case running time of insertion sort algorithm are  $O(n)$  and  $O(n^2)$  respectively. [4 Marks]

3. [CO-1,3] What is the running time of QUICKSORT when all elements of array  $A$  have the same value? Show that the running time of QUICKSORT is  $O(n^2)$  when the array  $A$  contains distinct elements and is sorted in decreasing order. [3 Marks]

4. [CO-1,3] a. Rewrite the Heap-SORT procedure to sort into non-increasing instead of non-decreasing order.  
b. Consider the following list of numbers

529, 627, 5, 127, 100, 152, 103, 3, 159, 610, 527

Show the step by step execution of your algorithm on the above list of numbers.

[2 + 3 = 5 Marks]