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...mester IV (B.Tech)

Er. No. 2116353

Academic Year: 2022-23

Jaypee University of Engineering & Technology, Guna

T-1(Even Semester 2023)

18B11CI412 – ALORITHMS AND PROBLEM SOLVING

Maximum Duration: 1 Hour

Maximum Marks: 15

Notes:

1. This question paper has ***three*** questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

			Marks	CO No.
Q1.	**(a)**	Write a recursive function for the running time T(n) of the function given below. Prove using iterative method that $T(n) = O(n^3)$.	**[03]**	**CO3**

```
def function(n):
    count=0
    if n<=0:
        return
    for i in range (0, n):
        for j in range (0, n):
            count=count+1
    function(n-3)
    print(count)
```

CO2

CO3

	(b)	Suppose we are sorting an array of eight integers using heap-sort, and we have just finished some heapify (either max-heapify or min-heapify) operations. The array now looks like this: 16 14 15 10 12 27 28. How many heapify operations have been performed on root of heap? Justify your outcome.	**[02]**	**CO3**
Q2.	**(a)**	A 3-ary max heap is like a binary max heap, but instead of 2 children, nodes have 3 children. A 3-ary heap can be represented by an array as follows: The root is stored in the first location, a[0], nodes in the next level, from left to right, is stored from a[1] to a[3]. The nodes from the second level of the tree from left to right are stored from a[4] location onward. An item x can be inserted into a 3-ary heap containing n items by placing x at the location a[n] and pushing it up the tree to satisfy the heap property. Design and discuss efficient procedure to **build 3-ary max heap**.	**[03]**	**CO4**

(b) Can the master method be applied to the recurrence $T(N) = 4T(N/2) + N^2 \log N$? Why or why not? Give an asymptotic upper bound for this recurrence. **[02]** CO4

Q3. (a) Illustrate the operation of COUNTING-SORT on the array A =(6,0,2,0,1,3,4, 6,1,2). Suppose that we rewrite the for loop header in line 10 of the COUNTING SORT as **10. for j = 1 to A.length** **[03]** CO2

Show that the algorithm still works properly. Is the modified algorithm stable?

(b) illustrate the operation of RADIX-SORT on the following list of English words: COW, DOG, SEA, RUG, ROW, MOB, BOX, TAB, BAR, EAR, TAR **[02]** CO2