ALGORITHM DESIGN 1(CSE3131)

Practice Question SET-2

- You are allowed to use only those concepts which are covered in the lecture class till date

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1. Compare the following functions based on asymptotic notations
   $f(n) = \sqrt{n}$ and $g(n) = (\log n)^2$
2. Compare the following functions based on asymptotic notations
   $f(n) = \log(\log n)$ and $g(n) = \sqrt{n}$
3. Compare the following functions based on asymptotic notations
   $f(n) = n^{1.5}$ and $g(n) = n \log n$

4. The total number of comparisons in bubble sort is
   A. (n.logn)
   B . (2n)
   C . (n^2)
   D. None of the above
5. Running time of an algorithm T(n), where n is input size, is given by T(n) = 8T(n/2) + qn, if n > 1 and T(n) = p if n = 1, where p and q are constants. The order of the algorithm is
   A. n^2
   B. n^n
   C. n^3
   D. n
6. An algorithm consists of two modules: x1 and x2. Their orders are f(n) and g(n) respectively. The order of the algorithm is
   A.max [f(n),g(n)]
   B. min [f(n),g(n)]
   C. f(n)+g(n)
   D. f(n)*g(n)
7. Running time T(n) where 'n' is the input size of the recursive algorithm given as : T(n) = c + T(n-1), if n > 1 ; T(n) = d if n < 1. The order of the algorithm is
   A. n^2
   B. n
   C. n^3
   D. n^n
8. Which of the following functions has the largest growth rate?
   A. n^(1/2)
   B. n^100
   C. 2^(n/2)

D. 2^(n!)

9. If we start with node 10 in V_T as the starting node and use Prim's algorithm to construct the minimum spanning tree give the order in which nodes enter V_T. Also, give the minimum total weight.

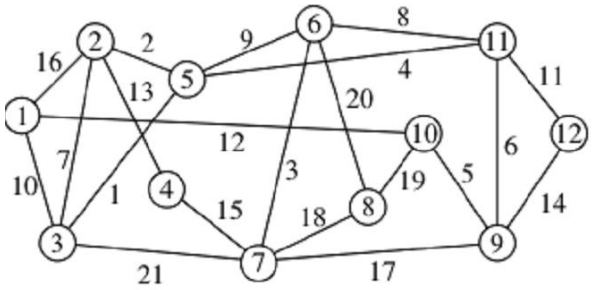

Figure 1: Graph for question 1(e).

Ans: The order is 10, 9, 11, 5, 3, 2, 6, 7, 1, 12, 4, 8. Total weight 81

10. Is the array with values <23, 17, 14, 6, 13, 10, 1, 5, 7, 12> a max-heap? If not then build the max heap. Ans: No. Max Heap = <23,17,14,7,13,10,1,5,6,12>

11. Illustrate the operation of MAX-HEAPIFY (A,3) on the array A =<27, 17,3,16,13,10,1,5,7,12,4,8,9,0>. Ans: <27,17,10,16,13,9,1,5,7,12,4,8,3,0>

12. Let the running time of a recursive algorithm satisfy the recurrence: T (n) = aT (√ n) + h(n). Deduce the running time T (n) in asymptotic Θ notation for the cases:

h(n) = n^d for some d ∈ {1, 2, 3, . . .},

13. Let the running time of a recursive algorithm satisfy the recurrence: T (n) = aT (√ n) + h(n). Deduce the running time T (n) in asymptotic Θ notation for the cases:

h(n) = $\log^d n$ for some d ∈ {0, 1, 2, . . .}

14. Consider an array representation of an n element binary heap where the elements are stored from 1 to index n of the array. For the element stored in index i of the array (i<=n), the index of the parent is

A) A[1] B) (i+1)/2 C) ⌊ i/2 ⌋ D) ⌈ i/2 ⌉ E) None

15. Show the correct matching

I.	MAX-HEAPIFY	a. O(lgn)
II.	BUILD-MAX-HEAP	b. O(n)
III.	HEAP-SORT	c . O(nlgn)
IV.	MAX-HEAP-INSERT	d. O(lgn)
V.	HEAP-EXTRACT-MAX	e. O(lgn)
VI.	HEAP-MAXIMUM	f. O(1)

A) I-a, II-b, III-d, IV-c, V-e, VI-f B) I-a, II-c, III-b, IV-d, V-e, VI-f **C)** I-a, II-b, III-c, IV-d, V-e, VI-f
D) I-c, II-b, III-a, IV-d, V-e, VI-f

16. The following array contains the entire integer up to 13.

13	8	a	b	c	d	5	6	4	1	2	10	9

Write the value of a, b, c and d so that it is a MAX HEAP?

A) a= 12, b=7, c=11, d=3 B) a= 11, b=7, c=3, d=12 C) a= 12, b=7, c=3, d=11 D) a= 7, b=13, c=3, d=11

17. Suppose we are comparing implementation of INSERTION sort and HEAP sort on the same machine. For i/p of size n INSERTION sort runs in $8n^2$ steps, while HEAP sort run in 64nlogn steps. For which values of n does INSERTION sort beat HEAP sort?

A) n<=15 B) n=7 C) n<=5 D) n>0

18. A binary-heap is a nearly complete binary tree with the following properties

I. Heap property
II. Sorting property
III. Structural property
IV. Tree property

A) I and IV B) I and II C) I and III D) I