Placement Preparation Paper - I

Topics: Complexity Analysis, Discrete Maths, Sorting, Data structures

Questions: 30 Time: 1 hour

1. Complexity of finding the gcd of a and b is most close to
   a. $\log_2(\max(a,b))$
   b. $F^{-1}(\max(a,b))$, where F is the fibonacci function
   c. $\log^*_2(\max(a,b))$
   d. O(max(a,b))

2. Worlds in the game of Super Mario are named i,j, (1<=i,j<=n) Eg. 1,1 ..... 1,n.... n,n. At the completion of each world i,j, Mario can only go to level i+1,j or i,j+1 (provided they exist). In how many ways, Mario can reach world n,n (and kill the boss completing the quest)?
   a. (2n-2)C(n-1)
   b. (2n)C(n)
   c. (2n-1)C(n)
   d. None of the above

3. The correct order of the efficiency of the following sorting algorithms according to their overall running time comparison is
   a. Insertion>selection>bubble
   b. Insertion>bubble>selection
   c. Selection>bubble>insertion
   d. bubble>selection>insertion

4. A sort which compares adjacent elements in a list and switches where necessary is
   a. Insertion sort
   b. Selection sort
   c. Bubble Sort
   d. Quick sort

5. Suppose we are sorting an array of eight integers using a some quadratic sorting algorithm. After four iterations of the algorithm’s main loop,

the array elements are ordered as shown here:2 4 5 7 8 1 3 6

a. Insertion sort
b. Selection sort
c. Either of a and b
d. Neither a nor b

6. An AVL Tree is constructed by inserting the elements in the following order 5,4,2,3,7,6 the elements which are in the leaf node are
   a. 2,7,6
   b. 5,7
   c. 3,6
   d. 5,3,7

7. What is the complexity of f(n)=5f(n/2)+3
   a. O(n^log 5) (base is 2)
   b. O(n)
   c. O(n log 2)
   d. O(n^5)

8. The fraction has numerator (21n+4) and denominator (14n+3).
   a. It is irreducible for finitely many n, n>0
   b. It is irreducible for infinitely many n but not for all n
   c. It is irreducible for all n
   d. It is reducible for all n

9. How many ways can 8 couples be seated in a round table if each couple is seated together?
   a. 2^8 7!
   b. 2^8 8!
   c. 2^7 7!
   d. 2^7 8!

10. In sorting 6,5,3,1,8,7,2,4 by heap sort a max heap is created by adding the elements one by one then in this case the first elements to be swapped are
    a. 5, 8

b. 6, 5
c. 1, 7
d. 5, 3

11. One of the reason why quick sort is better compared to other sorts is
    a. its space complexity is theta(log n)
    b. its running time is O(n^2)
    c. its space complexity is theta(n)
    d. its running time is O(n)

12. There are 80 coins, one is counterfeit (has weight different than others), min number of weighings needed to find it?
    a. 3
    b. 4
    c. 5
    d. 6

13. Which of the following is/are true
    a. AVL Tree was the first self-balancing BST to be invented
    b. The insertion of an element in an AVL tree takes O(log n) time in average case and O(nlogn) in worst case
    c. The insertion of an element in an AVL tree takes O(log n) time in both average and worst case
    d. The insertion of an element in AVL tree takes O(nlog n) time in both average and worst case

    a. Only a is correct
    b. Only d is correct
    c. both a and b are correct
    d. both a and c are correct

14. The running time of quick sort largely depends on
    a. number of inputs
    b. selection of pivot element
    c. size of element
    d. arrangement of elements

15. A binary tree with n nodes has exactly how many null branches?
    a. 2n
    b. n
    c. n+1
    d. n-1

16. The input to a merge sort is 6,5,4,3,2,1 and the same input is applied to quick sort then which is the best algorithm in this case
    a. Merge Sort
    b. Quick sort
    c. Both have same time complexity in this case as they have same running time
    d. Cannot be decided

17. If there are n nodes, there are how many different trees possible?
    a. 2^n - n
    b. 2^n - n + 1
    c. 2^n
    d. 2^n + n -1

18. The worst case time and worst case space complexity of radix sort is, where k is the number of radix-size
    a. O(k*N^2),O(N*lg (N))
    b. O(N^2),O(k*N)
    c. O(k*N),O(k*N)
    d. O(k*lg (N)),O(N^2)

19. The following steps were followed during the creation of particular AVL Tree, then what is the balance factor of the root node after the process -elements are inserted in the order 8,6,15,3,19,29 -The element 19 is removed -Then the element 6 is removed
    a. 1
    b. -1
    c. 0
    d. 2

20. Sorting is not possible in which of the following methods?
    a. Selection
    b. Deletion
    c. Insertion
    d. Exchange

21. There exists a bijection between any which of the following sets.
    a. The set of words of length n on an alphabet consisting of m letters.
    b. The set of maps of an n-set into a m-set.
    c. The set of distributions of n distinct objects into m distinct boxes.
    d. The set of n-tuples on m letters.

    a. Only a and b
    b. Only b and d
    c. Between a, b and d
    d. All 4

22. How many TRAILING zeroes are there in 100! (100 factorial)?
    a. 100
    b. 113
    c. 127
    d. 104

23. The number of swappings needed to sort the numbers 8, 22, 7, 9, 31, 19, 5, 13 in ascending order, using bubble sort is
    a. 9
    b. 10
    c. 13
    d. 14

24. Most large searches done on database system are on disk so which of the following tree is most commonly used
    a. B-Trees
    b. B+ trees

c. AVL trees
d. binary search tree

25. As part of the maintenance work, you are entrusted with the work of rearranging the library books in a shelf in proper order, at the end of each day. The ideal choice will be
    a. Bubble Sort
    b. Insertion Sort
    c. Selection Sort
    d. Merge Sort

26. You have 20 blue balls and 14 red balls in a bag. you put your hand in and remove 2 at a time. If they're of the same color, you add a blue ball to the bag. If they're of different colors, you add a red ball to the bag. (assume you have a big supply of blue & red balls for this purpose. note: when you take the two balls out, you don't put them back in, so the number of balls in the bag keeps decreasing). What will be the color of the last ball left in the bag?
    a. Red
    b. Blue
    c. Its different for different initial choice but later choices are of no importance
    d. Its different if at any point we make a different choice

27. Which of the following statements are right about radix sort?
    a. LSD radix sort is a stable sort.
    b. To sort a given set of numbers in increasing order, the MSD of the numbers are considered first.
    c. Both the above statements are right.
    d. None of the statements are right.

28. LSD radix sort is applied on the following set of numbers: 21,86,124,33,29,163.What will be the order of numbers just before the MSD is considered?
    a. 21,33,163,124,86,29
    b. 21,29,33,86,124,163

c. 21,124,29,33,163,86
d. 21,29,86,33,124,163

29. The balance factor of a node A was 0 and a node was inserted to the left of the node A then
    a. then it is required to balance Node A
    b. then it is required to balance Parent of node A
    c. then it is required to balance Right child of A
    d. Balancing may or may not be required for A

30. When inorder traversing a tree resulted G A L X Y H C B G; the preorder traversal would return
    a. YAGXLCBHG
    b. YAGXLCHGB
    c. GAYXHCLBG
    d. YGAXCLHBG