

1. The running time of the following sorting algorithm depends on whether the partitioning is balanced or unbalanced

- A. Insertion sort
- B. Selection sort
- C. Quick sort
- D. Merge sort

2. A desirable choice for the partitioning element in quick sort is

- A. First element of the list
- B. Last element of the list
- C. Randomly chosen element of the list
- D. Median of the list

3. The best average behaviour is shown by

- A. Quick Sort
- B. Merge Sort
- C. Insertion Sort
- D. Heap Sort

4. The complexity of searching an element from a set of n elements using Binary search algorithm is

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

5. 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. 10
- B. 9
- C. 13
- D. 14

6. The running time of merge sort can be recursively represented by

- A. $T(n) = 2T(n/2) + n$
- B. $T(n) = 3T(n/2) + n$
- C. $T(n) = 4T(n/2) + n$
- D. $T(n) = 2T(n/4) + n$

7. 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

8. Find the total number of steps for the following code

```
sum(array, n)
{
  1.1 tsum = 0;
  1.2 for (i=0 ; i<n ; i++)
  1.2.1 tsum = tsum + array[i];
  1.3 return tsum;
}
```

- a. $3n+4$
- b. $2n+4$
- c. $2n$
- d. $3n$

9. Code Tuning means?

- A. Modifying the entire code
- B. modifying the implementation of a specific design rather than modifying the design itself
- C. Modifying the Design
- D. All the above options

10. Which of the following is not an asymptotic notation?

- A. O
- B. Ω
- C. Θ
- D. Φ

11. If 21 is the pivot element then what will be its location after first call to partition method for the following elements- 21 63 45 78 12 14 47 85 20 (First element is at location one)

- A. third
- B. fourth
- C. fifth
- D. sixth

12. Consider a function that reads numbers of a matrix and outputs the sum of all the entries. What could be the worst-case complexity of this program?

- A. $O(n)$
- B. $O(n^2)$
- C. $O(n \log n)$
- D. $O(\log n)$

13. Which of the following is not a limitation of binary search algorithm?

- A. must use a sorted array
- B. requirement of sorted array is expensive when a lot of insertion and deletions are needed
- C. there must be a mechanism to access middle element directly
- D. binary search algorithm is not efficient when the data elements are more than 1000.

14. The term pivot element is related to which of the following sort?

- A. Merge sort
- B. Bubble sort
- C. Quick sort
- D. Selection sort

15. The worst case complexity of quick sort is?

- A. $O(n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n \log n)$

16. Which one is not Divide and Conquer algorithm?

- A. Merge sort
- B. Quick sort
- C. Heap sort
- D. None of the above

17. Suppose we are sorting an array of eight integers using quick sort, and we have just finished the first partitioning with the array looking like this:

2 5 1 7 9 12 11 10

Which statement is correct?

- A. The pivot could be either the 7 or the 9.
- B. The pivot could be the 7, but it is not the 9.
- C. The pivot is not the 7, but it could be the 9.
- D. Neither the 7 nor the 9 is the pivot.

18. Which of the following is the tightest upper bound that represent the no of swaps required to sort n number using selection sort

- A. $\log n$
- B. n
- C. $n \log n$
- D. n^2

19. Which of the following is the tightest upper bound that represent the complexity of inserting an element in binary search tree of n nodes

- A. 1
- B. $\log n$
- C. n
- D. $n \log n$

20. Consider an array of 50 elements how many move operations will be performed for deleting first 25 element starting from 25th location and remaining 25 elements from the 0th location one by one?

- A.50
- B.25
- C.600
- D.300

21. Which of the given options provides the increasing order of asymptotic complexity of functions f_1 , f_2 , f_3 and f_4 ?

$$f_1(n) = 2^n$$

$$f_2(n) = n^{3/2}$$

$$f_3(n) = n \log n$$

$$f_4(n) = n^{(\log n)}$$

- A. f_3 , f_2 , f_4 , f_1
- B. f_3 , f_2 , f_1 , f_4
- C. f_2 , f_3 , f_1 , f_4
- D. f_2 , f_3 , f_4 , f_1

22. In the following C function, let $n \geq m$.

```
int gcd(n,m)
{
    if (n%m == 0) return m;
    n = n%m;
    return gcd(m,n);
}
```

How many recursive calls are made by this function?

- A. $\theta(\log n)$
- B. $\omega(n)$
- C. $\theta(\log \log n)$
- D. $\theta(\sqrt{n})$

23. In a binary max heap containing n numbers, the smallest element can be found in time

- A. $O(n)$
- B. $O(\log n)$
- C. $O(\log \log n)$
- D. $O(1)$

24. Which one of the following in place sorting algorithms needs the minimum number of swaps?

- A. Quick sort
- B. Insertion sort

C. Selection sort

D. Heap sort

25. Consider the polynomial $p(x) = a_0 + a_1x + a_2x^2 + a_3x^3$, where $a_i \neq 0$, for all i . The minimum number of multiplications needed to evaluate p on an input x is:

A. 3

B. 4

C. 6

D. 9

26. The minimum number of multiplication operations required to evaluate the polynomial $P(X) = X^5 + 4X^3 + 6X + 5$ for a given value of X using only one temporary variable.

A. 4

B. 8

C. 9

D. 6

27. Time complexity refers to

A. Complexities involved in calculation of execution time of a program

B. Amount of time a program needs to run to completion

C. Complexities involved with input time of a program

D. None of the above

28. Which one of the following is the tightest upper bound that represents the time complexity of inserting an object into a binary search tree of n nodes?

(A) $O(1)$

(B) $O(\log n)$

(C) $O(n)$

(D) $O(n \log n)$

29. Which of the following is not the property of algorithm

A. Finiteness

B. Effectiveness

C. Input

D. Efficiency

30. How do you determine the cost of a spanning tree?

A. By the sum of the costs of the edges of the tree

- B. By the sum of the costs of the edges and vertices of the tree
- C. By the sum of the costs of the vertices of the tree
- D. By the sum of the costs of the edges of the graph

31. Which of the following does not belong to the same algorithm paradigm which the other belongs to?

- A. Minimum & Maximum problem
- B. Knapsack problem
- C. Selection problem
- D. Merge sort

32. The optimal solution to a problem is a combination of optimal solutions to its sub-problems. This is known as

- A. Principle of Duality
- B. Principle of Feasibility
- C. Principle of Optimality
- D. Principle of Dynamicity.

33. In Knapsack problem, the best strategy to get the optimal solution, where P_i , W_i is the Profit, Weight associated with each of the i th object respectively is to

- A. Arrange the values P_i/W_i in ascending order
- B. Arrange the values P_i/X_i in ascending order
- C. Arrange the values P_i/W_i in descending order
- D. Arrange the values P_i/X_i in descending order

34. Breadth first search

- A. Scans all incident edges before moving to other vertex
- B. Scans adjacent unvisited vertex as soon as possible
- C. Is same as backtracking
- D. Computes a path between two vertices of graph or equivalently

35. How many minimum number of spanning trees, one can have from a given connected graph with N nodes is having different weights for the edges.

- A. $N-1$
- B. One
- C. $1/(N+1)$
- D. $2N$

36. The method will choose when sub problems share sub problems

- A. Divide and conquer
- B. Greedy method
- C. Dynamic programming
- D. Back tracking

37. Which is not a feasible solution in the case of job sequence problem

item : 1 2 3 4
profit : 100 10 15
27

deadline :

- 2 1 2 1
- A. (1,4)
 - B. (4,3)

- C. (2,4)
- D. (1,2)

38. BFS is best compared to DFS in the case of _____

- A. The graph's width is large
- B. The graph's depth is large
- C. The graph consists of many nodes
- D. The graph is complex

39. The files x_1, x_2, x_3 are 3 files of length 30, 20, 10 records each. What is the optimal merge pattern value?

- A. 110
- B. 60
- C. 90

D. 50

40. Dijkstra's algorithm :

- A. Has greedy approach to find all shortest paths
- B. Has both greedy and Dynamic approach to find all shortest paths
- C. Has greedy approach to compute single source shortest paths to all other vertices
- D. Has both greedy and dynamic approach to compute single source shortest paths to all other vertices.

41. which is optimal value in the case of job sequence problem

item : 1 2 3 4 5 6 7

profit : 3 5 20 18 1 6
30

deadline : 1 3 4 3 2 1 2

- A. (1,5,6,4)
- B. (2,3,1,7)
- C. (7,6,4,3)
- D. (1,2,3,4)

42. A text is made up of characters a,b,c,d and e each occurring with the probability 0.12,0.4,0.15,0.08,0.25 respectively. The optimal coding technique will have the average length of (Use Huffman coding)

- A. 2.15
- B. 3.01
- C. 2.3
- D. 1.78

43. A spanning tree of a graph is one that includes:

- A. All the Vertices of the graph
- B. All the edges of the graph
- C. Only vertices of odd degree
- D. Only vertices of even degree

44. An undirected graph G has n nodes. Its adjacency matrix is given by an $n \times n$ square matrix whose (i) diagonal elements are 0's and (ii) non-diagonal elements are 1's. Which one of the following is TRUE?

- A. Graph G has no minimum spanning tree (MST)
- B. Graph G has a unique MST of cost n-1
- C. Graph G has multiple distinct MSTs, each of cost n-1

D. Graph G has multiple spanning trees of different costs

45. Which one of the following cannot be the sequence of edges added, in that order, to a minimum spanning tree using Kruskal's algorithm?

- A. (a—b), (d—f), (b—f), (d—c), (d—e)
- B. (a—b), (d—f), (d—c), (b—f), (d—e)
- C. (d—f), (a—b), (d—c), (b—f), (d—e)
- D. (d—f), (a—b), (b—f), (d—e), (d—c)**

46. Let G be an undirected connected graph with distinct edge weight. Let e_{\max} be the edge with maximum weight and e_{\min} the edge with minimum weight. Which of the following statements is false?

- A. Every minimum spanning tree of G must contain e_{\min}
- B. If e_{\max} is in a minimum spanning tree, then its removal must disconnect G**
- C. No minimum spanning tree contains e_{\max}
- D. G has a unique minimum spanning tree

47. Let G be connected undirected graph of 100 vertices and 300 edges. The weight of a minimum spanning tree of G is 500. When the weight of each edge of G is increased by five, the weight of a minimum spanning tree becomes _____.

- A. 1000
- B. 995
- C. 2000
- D. 1995

Its adjacency matrix is given by an $n \times n$ square matrix whose (i) diagonal elements are 0's and (ii) non-diagonal elements are 1's. Which one of the following is TRUE?

- A. Graph G has no minimum spanning tree (MST)
- B. Graph G has a unique MST of cost $n-1$
- C. Graph G has multiple distinct MSTs, each of cost $n-1$
- D. Graph G has multiple spanning trees of different costs

48. Consider the following graph. Among the following sequences

- I) a b e g h f
 - II) a b f e h g
 - III) a b f h g e
 - IV) a f g h b e
- Which are depth first traversals of the above graph?

- A. I, II and IV only
- B. I and IV only
- C. II, III and IV only
- D. I, III and IV only

49. Suppose depth first search is executed on the graph below starting at some unknown vertex. Assume that a recursive call to visit a vertex is made only after first checking that the vertex has not been visited earlier. Then the maximum possible recursion depth (including the initial call) is _____.

□

- A. 17
- B. 18
- C. 19
- D. 20