

## Design and analysis of algorithm

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- 1. Which Data Structure is used to perform Recursion?**
  - A : Array
  - B : queue
  - C : stack
  - D : linked list
- 2. What is the objective of the knapsack problem?**
  - A : To Get Maximum Total Value In The Knapsack
  - B : To Get Minimum Total Value In The Knapsack
  - C : To Get Maximum Weight In The Knapsack
  - D : To Get Minimum Weight In The Knapsack
- 3. Which of the following algorithm can be used to solve the Hamiltonian path problem efficiently?**
  - A : branch and bound
  - B : iterative improvement
  - C : divide and conquer
  - D : greedy algorithm
- 4. What is the worst case time complexity of merge sort?**
  - A :  $O(N \log N)$
  - B :  $O(n*n)$
  - C :  $O(\log N)$
  - D :  $O(\log \log N)$
- 5. What is tail recursion?**
  - A : A recursive function that has two base cases
  - B : A function where the recursive functions leads to an infinite loop
  - C : A recursive function where the function doesn't return anything and just prints the values
  - D : A function where the recursive call is the last thing executed by the function**
- 6. Fractional knapsack problem is also known as**
  - A : 0/1 knapsack problem
  - B : Continuous knapsack problem**
  - C : Divisible knapsack problem
  - D : Non continuous knapsack problem
- 7. What approach is being followed in Floyd Warshall Algorithm?**
  - A : Greedy Technique

- B : Dynamic Programming
- C : Linear Programming
- D : Backtracking

**8. Which of the following algorithms has worst time complexity?**

- A : insertion sort
- B : binary search
- C : linear search
- D : merge sort

**9. Which data structure is used for implementing a FIFO branch and bound strategy?**

- A : Stack
- B : Queue
- C : Array
- D : Linked List

**10. Fractional knapsack problem is solved most efficiently by which of the following algorithm?**

- A : Divide And Conquer
- B : Dynamic Programming
- C : Greedy Algorithm
- D : Backtracking

**11. Which algorithm startegy builds up a solution by choosing the option that looks the best at every step.**

- A : greedy method
- B : branch and bound
- C : dynamic programming
- D : divide and conquer

**12. Dynamic programming is used to find:**

- A : All Optimal Solution Is Generated
- B : One Solution Is Generated
- C : No Optimal Solution Is Generated
- D : Partial Solution Is Generated

**13. What is the purpose of using randomized quick sort over standard quick sort?**

- A : To reduce worst case space complexity
- B : To reduce worst case time complexity
- C : To improve average case time complexity
- D : To improve accuracy

**14. If  $T = abcabaabc$  &  $P = abaa$  then what will be the value of lcs?**

- A : 4
- B : 2
- C : 3
- D : 1

**15. Which data structure has a better amortized running time than others?**

- A : Queue
- B : Stack
- C : Priority Queue**
- D : List

**16. Which data structure is most suitable for implementing best first branch and bound strategy?**

- A : Stack
- B : Queue**
- C : Priority Queue
- D : Linked List

**17. Which of the following is/are property/properties of a dynamic programming problem?**

- A : Evolutionary Approach
- B : Require More Time
- C : Greedy Approach
- D : Optimal Substructure And Overlapping Sub problem**

**18. Identify incorrect statement**

- A :  $f(n) = \Theta(g(n))$  and  $g(n) = \Theta(h(n))$ , then  $f(n) = \Theta(h(n))$
- B :  $f(n) = \Theta(g(n))$  if and only if  $g(n) = \Theta(f(n))$
- C :  $f(n) = O(g(n))$  if and only if  $g(n) = \Omega(f(n))$
- D : If  $f(n) = O(g(n))$  and  $g(n) = O(h(n))$ , then  $f(n) \neq O(h(n))$**

**19. Given items as {value,weight} pairs  $\{\{60,20\},\{50,25\},\{20,5\}\}$ . The capacity of knapsack=40. Find the maximum value output assuming items to be divisible and nondivisible respectively.**

- A : 10080
- B : 11070
- C : 130110
- D : 11080**

**20. Time complexity of LCS Select one:**

- A :  $O(M!)$
- B :  $O(Mn)$**
- C :  $O(N!)$
- D :  $O(N)$

**21. In greedy method which type of solution is generated**

- A : Optimal solution**
- B : Best solution
- C : Worst solution
- D : All solutions

22. The name backtrack was first coined by \_\_\_\_\_

- A : D.H.Lehmer
- B : L.Baumert
- C : R.J.Walker
- D : S. Golomb

23. Given items  $I = (I_1, I_2, I_3, I_4, I_5)$ ,  $w = (5, 10, 20, 30, 40)$  and  $v = (30, 20, 100, 90, 160)$ .

The capacity of knapsack  $W = 60$ . Find the maximum profit using fractional knapsack.

- A : 250
- B : 270
- C : 290
- D : 130

24. The \_\_\_\_\_ of an algorithm is the amount of memory it needs to run to completion.

- a. Space Complexity
- b. Time Complexity
- c. Best Case
- d. Worst Case

25. A Priority-Queue is implemented as a Max-Heap. Initially, it has 5 elements. The levelorder traversal of the heap is given below: 10, 8, 5, 3, 2 Two new elements 1 and 7 are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is

- A) 10, 8, 7, 5, 3, 2, 1
- B) 10, 8, 7, 2, 3, 1, 5
- C) 10, 8, 7, 1, 2, 3, 5
- D) 10, 8, 7, 3, 2, 1, 5

26. Huffman codes are the applications of \_\_\_\_\_ with minimal weighted external path length obtained by an optimal set.

- a. BST
- b. MST
- c. Binary tree
- d. Weighted Graph

27. Which of the following sorting algorithms does not have a worst case running time of  $O(n^2)$  ?

- Quick sort
- b. Merge sort
- c. Insertion sort
- d. Bubble sort

28. job sequencing with deadline is based on \_\_\_\_\_ method

- a. greedy method
- b. dynamic programming
- c. branch and bound
- d. divide and conquer

29. . Steps of Divide and Conquer approach Select one:

- a. Divide, Conquer and Combine
- b. Combine, Conquer and Divide
- c. Combine, Divide and Conquer
- d. Divide, Combine and Conquer

30.----- is the first step in solving the problem

- A. Understanding the Problem
- B. Identify the Problem
- C. Evaluate the Solution
- D. None of these

31. \_\_\_\_\_ solution requires reasoning built on knowledge and experience

- A. Algorithmic Solution
- B. Heuristic Solution
- C. Random Solution
- D. None of these

There are four algorithms A1, A2, A3, A4 to

32. solve the given problem with the order  $\log(n)$ ,  $n\log(n)$ ,  $\log(\log(n))n/\log(n)$ , Which is the best algorithm.

- A. A1
- B. A2
- C. A3
- D. A4

33. The complexity of three algorithms is given as:  $O(n)$ ,  $O(n^2)$  and  $O(n^3)$ . Which should execute slowest for large value of  $n$ ?

- A.  $O(n)$
- B.  $O(n^2)$
- C.  $O(n^3)$
- D. All will execute in same time.

34. Express the formula  $(n-1)*(n-5)$  in terms of big Oh notation

- A.  $O(1)$
- B.  $O(\log n)$
- C.  $O(n)$
- D.  $O(n^2)$

35. How many passes are required to sort a file of size  $n$  by bubble sort method?

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- A.  $N^2$
- B.  $N$
- C.  $N-1$
- D.  $N/2$

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**36.** Which of the following is false in the case of a spanning tree of a graph  $G$ ?

- a) It is tree that spans  $G$
- b) It is a subgraph of the  $G$
- c) It includes every vertex of the  $G$
- d) It can be either cyclic or acyclic**

**37.** Consider a complete graph  $G$  with 4 vertices. The graph  $G$  has \_\_\_\_\_ spanning trees.

- a) 15
- b) 8
- c) 16
- d) 13

**38.** The travelling salesman problem can be solved using \_\_\_\_\_

- a) A spanning tree
- b) A minimum spanning tree**
- c) Bellman – Ford algorithm
- d) DFS traversal

**39.** Consider a undirected graph  $G$  with vertices  $\{ A, B, C, D, E\}$ . In graph  $G$ , every edge has distinct weight. Edge  $CD$  is edge with minimum weight and edge  $AB$  is edge with maximum weight. Then, which of the following is false?

- a) Every minimum spanning tree of  $G$  must contain  $CD$
- b) If  $AB$  is in a minimum spanning tree, then its removal must disconnect  $G$
- c) No minimum spanning tree contains  $AB$
- d)  $G$  has a unique minimum spanning tree

**40.** If all the weights of the graph are positive, then the minimum spanning tree of the graph is a minimum cost subgraph.

- a) True**
- b) False

**41.** Which of the following is false?

- a) The spanning trees do not have any cycles
- b) MST have  $n - 1$  edges if the graph has  $n$  edges
- c) Edge  $e$  belonging to a cut of the graph if has the weight smaller than any other edge in the same cut, then the edge  $e$  is present in all the MSTs of the graph
- d) Removing one edge from the spanning tree will not make the graph disconnected**

- 42.** What is a Rabin and Karp Algorithm?
- String Matching Algorithm
  - Shortest Path Algorithm
  - Minimum spanning tree Algorithm
  - Approximation Algorithm
- 43.** What is the pre-processing time of Rabin and Karp Algorithm?
- $\Theta(m^2)$
  - $\Theta(m \log n)$
  - $\Theta(m)$
  - Big-Oh(n)
- 44.** Rabin Karp Algorithm makes use of elementary number theoretic notions.
- True
  - False
- 45.** What is the basic formula applied in Rabin Karp Algorithm to get the computation time as  $\Theta(m)$ ?
- Halving rule
  - Horner's rule
  - Summation lemma
  - Cancellation lemma
- 46.** . What is the worst case running time of Rabin Karp Algorithm?
- $\Theta(n)$
  - $\Theta(n-m)$
  - $\Theta((n-m+1)m)$
  - $\Theta(n \log m)$
- 47.** What happens when the modulo value(q) is taken large?
- Complexity increases
  - Spurious hits occur frequently
  - Cost of extra checking is low
  - Matching time increases
- 48.** Given a pattern of length- 5 window, find the spurious hit in the given text string.

Pattern: 3 1 4 1 5

Modulus: 13

Index: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Text: 2 3 5 9 0 2 3 1 4 1 5 2 6 7 3 9 9 2 1 3 9

- 6-10
- 12-16

- c) 3-7
- d) 13-17

49. If the expected number of valid shifts is small and modulus is larger than the length of pattern what is the matching time of Rabin Karp Algorithm?

- a) Theta(m)
- b) Big-Oh(n+m)**
- c) Theta(n-m)
- d) Big-Oh(n)

50. Who created the Rabin Karp Algorithm?

- a) Joseph Rabin and Michael Karp
- b) Michael Rabin and Joseph Karp
- c) Richard Karp and Michael Rabin**
- d) Michael Karp and Richard Rabin

51. QuickSort can be categorized into which of the following?

- a) Brute Force technique
- b) Divide and conquer**
- c) Greedy algorithm
- d) Dynamic programming

52. The given array is arr = {2,3,4,1,6}. What are the pivots that are returned as a result of subsequent partitioning?

- a) 1 and 3**
- b) 3 and 1
- c) 2 and 6
- d) 6 and 2

53. What is the worst case complexity of QuickSort?

- a)  $O(n \log n)$
- b)  $O(\log n)$
- c)  $O(n)$
- d)  $O(n^2)$**

54. What is a randomized QuickSort?

- a) The leftmost element is chosen as the pivot
- b) The rightmost element is chosen as the pivot
- c) Any element in the array is chosen as the pivot**
- d) A random number is generated which is used as the pivot



55. Which of the following is not true about QuickSort?
- a) in-place algorithm
  - b) pivot position can be changed**
  - c) adaptive sorting algorithm
  - d) can be implemented as a stable sort
56. Dijkstra's Algorithm is used to solve \_\_\_\_\_ problems.
- a) All pair shortest path
  - b) Single source shortest path**
  - c) Network flow
  - d) Sorting
57. Which of the following is the most commonly used data structure for implementing Dijkstra's Algorithm?
- a) Max priority queue
  - b) Stack
  - c) Circular queue
  - d) Min priority queue**
58. What is the time complexity of Dijkstra's algorithm?
- a)  $O(N)$
  - b)  $O(N^3)$
  - c)  $O(N^2)$**
  - d)  $O(\log N)$
59. Dijkstra's Algorithm cannot be applied on \_\_\_\_\_
- a) Directed and weighted graphs
  - b) Graphs having negative weight function**
  - c) Unweighted graphs
  - d) Undirected and unweighted graphs
60. How many times the insert and extract min operations are invoked per vertex?
- a) 1**
  - b) 2
  - c) 3
  - d) 0
61. The maximum number of times the decrease key operation performed in Dijkstra's algorithm will be equal to \_\_\_\_\_
- a) Total number of vertices
  - b) Total number of edges**
  - c) Number of vertices – 1
  - d) Number of edges – 1

62. The running time of Bellmann Ford algorithm is lower than that of Dijkstra's Algorithm.

- a) True
- b) False**

63. Dijkstra's Algorithm is the prime example for \_\_\_\_\_

- a) Greedy algorithm**
- b) Branch and bound
- c) Back tracking
- d) Dynamic programming

64. The Bellmann Ford algorithm returns \_\_\_\_\_ value.

- a) Boolean**
- b) Integer
- c) String
- d) Double

65. Bellmann ford algorithm provides solution for \_\_\_\_\_ problems.

- a) All pair shortest path
- b) Sorting
- c) Network flow
- d) Single source shortest path**

66. How many solution/solutions are available for a graph having negative weight cycle?

- a) One solution
- b) Two solutions
- c) No solution**
- d) Infinite solutions

67. What is the running time of Bellmann Ford Algorithm?

- a)  $O(V)$
- b)  $O(V^2)$
- c)  $O(E \log V)$
- d)  $O(VE)$**

68. How many times the for loop in the Bellmann Ford Algorithm gets executed?

- a)  $V$  times
- b)  $V-1$**
- c)  $E$
- d)  $E-1$

69. Dijkstra's Algorithm is more efficient than Bellmann Ford Algorithm.

- a) True**
- b) False

70. Bellmann Ford algorithm was first proposed by \_\_\_\_\_

- a) Richard Bellmann
- b) Alfonso Shimbe**
- c) Lester Ford Jr
- d) Edward F. Moore

71. Bellmann Ford Algorithm is an example for \_\_\_\_\_

- a) Dynamic Programming**
- b) Greedy Algorithms
- c) Linear Programming
- d) Branch and Bound

72. What does Maximum flow problem involve?

- a) finding a flow between source and sink that is maximum**
- b) finding a flow between source and sink that is minimum
- c) finding the shortest path between source and sink
- d) computing a minimum spanning tree

73. What is the source?

- a) Vertex with no incoming edges**
- b) Vertex with no leaving edges
- c) Centre vertex
- d) Vertex with the least weight

74. Which algorithm is used to solve a maximum flow problem?

- a) Prim's algorithm
- b) Kruskal's algorithm
- c) Dijkstra's algorithm
- d) Ford-Fulkerson algorithm**

75. The first step in the naïve greedy algorithm is?

- a) analysing the zero flow**
- b) calculating the maximum flow using trial and error
- c) adding flows with higher values
- d) reversing flow if required

76. In what time can an augmented path be found?

- a)  $O(|E| \log |V|)$
- b)  $O(|E|)$**
- c)  $O(|E|^2)$
- d)  $O(|E|^2 \log |V|)$

77. How many constraints does flow have?

- a) one
- b) three

- c) two
- d) four

78. A simple acyclic path between source and sink which pass through only positive weighted edges is called?

- a) augmenting path**
- b) critical path
- c) residual path
- d) maximum path

79. What is the running time of an unweighted shortest path algorithm whose augmenting path is the path with the least number of edges?

- a)  $O(|E|)$
- b)  $O(|E||V|)$
- c)  $O(|E|^2|V|)$**
- d)  $O(|E| \log |V|)$

80. Recursion is a method in which the solution of a problem depends on

- a) Larger instances of different problems
- b) Larger instances of the same problem
- c) Smaller instances of the same problem**
- d) Smaller instances of different problems

81. Which of the following problems can't be solved using recursion?

- a) Factorial of a number
- b) Nth fibonacci number
- c) Length of a string
- d) Problems without base case**

82. Recursion is similar to which of the following?

- a) Switch Case
- b) Loop**
- c) If-else
- d) if elif else

83. In recursion, the condition for which the function will stop calling itself is

- a) Best case
- b) Worst case
- c) Base case**
- d) There is no such condition

84. Which of the following statements is true?

- a) Recursion is always better than iteration
- b) Recursion uses more memory compared to iteration**

- c) Recursion uses less memory compared to iteration
- d) Iteration is always better and simpler than recursion

85. In general, which of the following methods isn't used to find the factorial of a number?

- a) Recursion
- b) Iteration
- c) Dynamic programming
- d) Non iterative / recursive**

86. Which of the following recursive formula can be used to find the factorial of a number?

- a)  $\text{fact}(n) = n * \text{fact}(n)$
- b)  $\text{fact}(n) = n * \text{fact}(n+1)$
- c)  $\text{fact}(n) = n * \text{fact}(n-1)$**
- d)  $\text{fact}(n) = n * \text{fact}(1)$

87. Suppose the first fibonacci number is 0 and the second is 1. What is the sixth fibonacci number?

- a) 5**
- b) 6
- c) 7
- d) 8

88. Which of the following is not a fibonacci number?

- a) 8
- b) 21
- c) 55
- d) 14**

89. Which of the following option is wrong?

- a) Fibonacci number can be calculated by using Dynamic programming
- b) Fibonacci number can be calculated by using Recursion method
- c) Fibonacci number can be calculated by using Iteration method
- d) No method is defined to calculate Fibonacci number**

90. Which of the following recurrence relations can be used to find the nth fibonacci number?

- a)  $F(n) = F(n) + F(n - 1)$
- b)  $F(n) = F(n) + F(n + 1)$
- c)  $F(n) = F(n - 1)$
- d)  $F(n) = F(n - 1) + F(n - 2)$**

91. Which of the following option is wrong about natural numbers?

- a) Sum of first n natural numbers can be calculated by using Iteration method
- b) Sum of first n natural numbers can be calculated by using Recursion method

- c) Sum of first  $n$  natural numbers can be calculated by using Binomial coefficient method  
**d) No method is prescribed to calculate sum of first  $n$  natural number**

92. Which of the following gives the sum of the first  $n$  natural numbers?

- a)  $nC2$   
b)  $(n-1)C2$   
**c)  $(n+1)C2$**   
d)  $(n+2)C2$

93. Which of the following methods used to find the sum of first  $n$  natural numbers has the least time complexity?

- a) Recursion  
b) Iteration  
**c) Binomial coefficient**  
d) All have equal time complexity

94. Which of the following methods can be used to find the sum of digits of a number?

- a) Recursion  
b) Iteration  
c) Greedy algorithm  
**d) Both recursion and iteration**

95. What can be the maximum sum of digits for a 4 digit number?

- a) 1  
b) 16  
**c) 36**  
d) 26

96. What can be the minimum sum of digits for a 4 digit number?

- a) 0  
**b) 1**  
c) 16  
d) 36

97. What is the time complexity of the above code used to reverse a string?

- a)  $O(1)$   
**b)  $O(n)$**   
c)  $O(n^2)$   
d)  $O(n^3)$

98. Which of the following is the binary representation of 100?

- a) 1010010  
b) 1110000  
**c) 1100100**  
d) 1010101

99. Which of the following sorting algorithm has best case time complexity of  $O(n^2)$ ?

- a) bubble sort
- b) selection sort**
- c) insertion sort
- d) stupid sort

100. Which of the following is the biggest advantage of selection sort?

- a) its has low time complexity
- b) it has low space complexity
- c) it is easy to implement
- d) it requires only n swaps under any condition**

101. Which of the following sorting algorithm is NOT stable?

- a) Selection sort**
- b) Brick sort
- c) Bubble sort
- d) Merge sort

102. What is the number of swaps required to sort the array  $arr=\{5,3,2,4,1\}$  using recursive selection sort?

- a) 0
- b) 1
- c) 2**
- d) 3

103. Which of the following statement is true about stack?

- a) Pop operation removes the top most element**
- b) Pop operation removes the bottom most element
- c) Push operation adds new element at the bottom
- d) Push operation removes the top most element

104. Stack can be reversed without using extra space by \_\_\_\_\_

- a) using recursion
- b) using linked list to implement stack**
- c) using an extra stack
- d) it is not possible

105. Which of the following techniques can be used to search an element in an unsorted array?

- a) Iterative linear search**
- b) Recursive binary search
- c) Iterative binary search
- d) Normal binary search

106. Consider the array {1,1,1,1,1}. Select the wrong option?

- a) Iterative linear search can be used to search for the elements in the given array
- b) Recursive linear search can be used to search for the elements in the given array
- c) Recursive binary search can be used to search for the elements in the given array
- d) No method is defined to search for an element in the given array**

107. Recursive program to raise an integer x to power y uses which of the following algorithm?

- a) Dynamic programming
- b) Backtracking
- c) Divide and conquer**
- d) Greedy algorithm