PUNE VIDYARTHI GRIHA'S

COLLEGE OF SCIENCE AND TECHNOLOGY

Affiliated to University of Mumbai

Question Bank

Class: S.Y.B. Sc.CS **Semester: IV**

Subject: Fundamentals of Algorithm

1. The word _____comes from the name of a Persian mathematician Abu Ja'far Mohammed ibn-i Musa al Khowarizmi.
   a) Flowchart
   b) Flow
   c) Algorithm
   d) Syntax

2. When an algorithm is written in the form of a programming language, it becomes a _____
   a) Flowchart
   b) Program
   c) Pseudo code
   d) Syntax

3. A system wherein items are added from one and removed from the other end.
   a) Stack
   b) Queue
   c) Linked List
   d) Array

4. Another name for 1-D arrays.
   a) Linear arrays
   b) Lists
   c) Horizontal array
   d) Vertical array

5. . A data structure that follows the FIFO principle.
   a) Queue
   b) LL
   c) Stack
   d) Union

6. Which of the following is false about a binary search tree?
   a) The left child is always lesser than its parent
   b) The right child is always greater than its parent
   c) The left and right sub-trees should also be binary search trees
   d) In order sequence gives decreasing order of elements

7. What is the speciality about the inorder traversal of a binary search tree?
   a) It traverses in a non increasing order
   b) It traverses in an increasing order
   c) It traverses in a random fashion
   d) It traverses based on priority of the node

8. What does the following piece of code do?

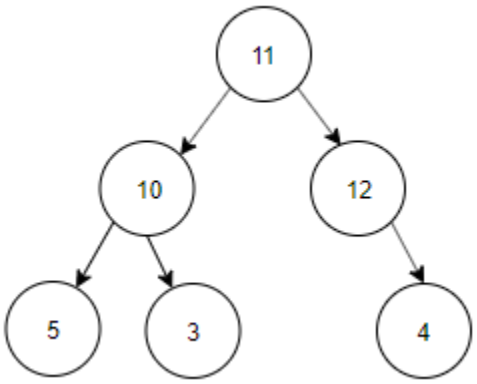
```
public void func(Tree root)
{
        func(root.left());
        func(root.right());
        System.out.println(root.data());
}
```

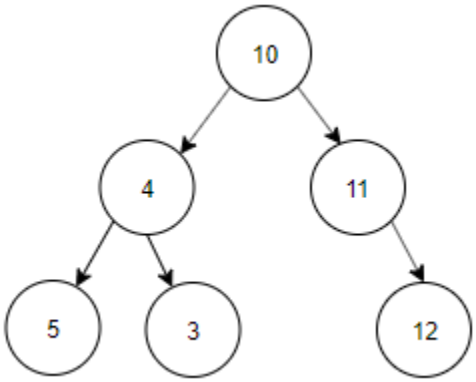
   a) Preorder traversal
   b) Inorder traversal
   c) Postorder traversal
   d) Level order traversal

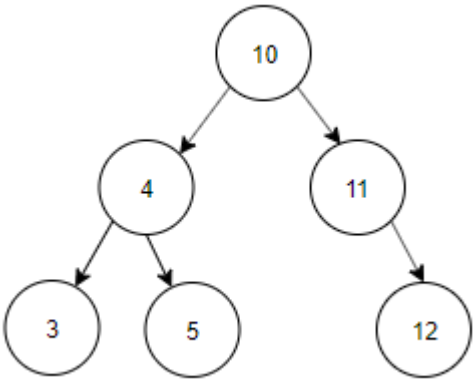
9. What are the worst case and average case complexities of a binary search tree?
   a) O(n), O(n)
   b) O(logn), O(logn)
   c) O(logn), O(n)
   d) O(n), O(logn)

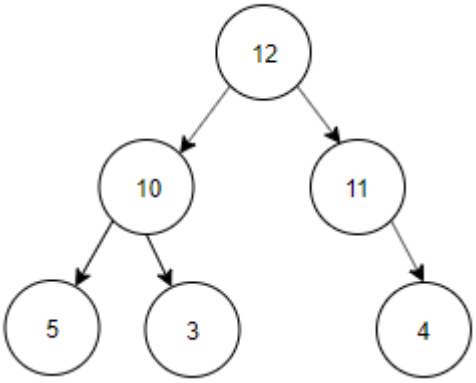
10. What are the conditions for an optimal binary search tree and what is its advantage?
    a) The tree should not be modified and you should know how often the keys are accessed, it improves the lookup cost
    b) You should know the frequency of access of the keys, improves the lookup time
    c) The tree can be modified and you should know the number of elements in the tree before hand, it improves the deletion time
    d) The tree should be just modified and improves the lookup time

11. Construct a binary search tree with the below information.
    The preorder traversal of a binary search tree 10, 4, 3, 5, 11, 12.









Answer:c

12. In preorder traversal of a binary tree the second step is _____
    a) traverse the right subtree

b) traverse the left subtree
c) traverse right subtree and visit the root
d) visit the root

13. An important application of binary tree is _____
    a) Huffman coding
    b) stack implementation
    c) queue implementation
    d) traverse a cyclic graph
14. From the following code identify the which traversal of a binary tree is this _____

```
//if node has left child
  order(node.left)
//if node has right child
  order(node.right)
  visit(node)
```

    a) Inorder traversal
    b) preorder traversal
    c) postorder traversal
    d) Euler tour traversal
15. What is the minimum height for a binary search tree with 60 nodes?
    a) 1
    b) 3
    c) 4
    d) 2
16. The time complexity of calculating the sum of all leaf nodes in an n-order binary tree is _____
    a) $O(n^2)$
    b) O(n+1)
    c) O(1)
    d) O(n)
17. An immediate application of a Depth First Search traversal is _____
    a) count the number of leaf nodes
    b) perform Inorder traversal in easy way
    c) count number of nodes
    d) implement preorder traversal
18. Breadth First Search traversal of a binary tree finds its application in _____
    a) Cloud computing
    b) Peer to peer networks
    c) Weighted graph
    d) Euler path
19. Worst case complexity of Breadth First Search traversal _____
    a) O(n*n)
    b) O(nlogn)
    c) $O(n^2 \log n)$
    d) $O(n^3)$

20. Spanning trees have a special class of depth-first search trees named _____
    a) Euclidean minimum spanning trees
    b) Tremaux trees
    c) Complete bipartite graphs
    d) Decision trees
21. If the weight of an edge e of cycle C in a graph is larger than the individual weights of all other edges of C, then that edge _____
    a) belongs to an minimum spanning tree
    b) cannot belong to an minimum spanning tree
    c) belongs to all MSTs of the graph
    d) can not belong to the graph
22. For every spanning tree with n vertices and n edges what is the least number of different Spanning trees can be formed?
    a) 2
    b) 5
    c) 3
    d) 4
23. Time complexity of Prim's algorithm is _____
    a) O((V+E)logV)
    b) O(E+V)
    c) O(E)
    d) O(V+1)
24. What is the time complexity of Kruskal's algorithm?
    a) O(ElogV)
    b) O(V+logE)
    c) O(E+1)
    d) $O(V^2)$
25. An immediate application of minimum spanning tree _____
    a) gesture analysis
    b) handwriting recognition
    c) fingerprint detection
    d) soft computing
26. If minimum cost edge of a graph is unique, then that edge will be added to any MST. Choose the correct option.
    a) false
    b) maximum cost edge is added
    c) true
    d) minimum cost edge need not be unique
27. A complete undirected graph of n nodes can have maximum _____ spanning trees.
    a) n^{n+1}
    b) n^{n-2}
    c) n(n+1)2
    d) n
28. The spanning tree will be maximally acyclic if _____
    a) one additional edge makes a cycle in the tree
    b) two additional edges makes a cycle in the tree

c) removing one edge makes the tree cycle free
d) removing two edges make the tree cycle free

29. In a maximum spanning tree the weighted graph is of _____
    a) maximum number of edges
    b) maximum number of cyclic trees
    c) minimum number of vertices
    d) maximum weight
30. Prim's algorithm can be implemented using _____
    a) a stack data structure
    b) radix sort
    c) priority queue data structure
    d) bubble sort
31. An undirected graph G which is connected and acyclic is called _____
    a) bipartite graph
    b) cyclic graph
    c) tree
    d) forest
32. An n-vertex graph has _____ edges.
    a) n^2
    b) n-1
    c) n*n
    d) n*(n+1)/2
33. What is a star tree?
    a) A tree having a single internal vertex and n-1 leaves
    b) A tree having n vertices arranged in a line
    c) A tree which has 0 or more connected subtrees
    d) A tree which contains n vertices and n-1 cycles
34. A polytree is called _____
    a) directed acyclic graph
    b) directed cyclic graph
    c) bipartite graph
    d) connected graph
35. The tree elements are called _____
    a) vertices
    b) nodes
    c) points
    d) edges
36. In an n-ary tree, each vertex has at most _____ children.
    a) n
    b) n^4
    c) n*n
    d) n-1
37. A graph which consists of disjoint union of trees is called _____
    a) bipartite graph
    b) forest

c) caterpillar tree
d) labeled tree

38. What is a bipartite graph?
a) a graph which contains only one cycle
b) a graph which consists of more than 3 number of vertices
c) a graph which has odd number of vertices and even number of edges
d) a graph which contains no cycles of odd length

39. If two cycle graphs Gm and Gn are joined together with a vertex, the number of spanning trees in the new graph is _____
a) m+n-1
b) m-n
c) m*n
d) m*n+1

40. For an n-vertex undirected graph, the time required to find a cycle is _____
a) O(n)
b) $O(n^2)$
c) O(n+1)
d) O(logn)

41. A binary cycle space forms a _____ over the two element field.
a) triangular graph
b) vector space
c) binary tree
d) hamiltonian graph

42. If G is a simple graph with n-vertices and n>=3, the condition for G has a Hamiltonian circuit is _____
a) the degree of each vertex is at most n/2
b) the degree of each vertex is equal to n
c) the degree of every vertex is at least n+1/2
d) the degree of every vertex in G is at least n/2

43. What is a separable graph?
a) A disconnected graph by deleting a vertex
b) A disconnected graph by removing an edge
c) A disconnected graph by removing one edge and a vertex
d) A simple graph which does not contain a cycle

44. Which algorithm efficiently calculates the single source shortest paths in a Directed Acyclic Graph?
a) topological sort
b) hash table
c) binary search
d) radix sort

45. The _____ of a graph G consists of all vertices and edges of G.
a) edge graph
b) line graph
c) path complement graph
d) eulerian circuit

46. A _____ in a graph G is a circuit which consists of every vertex (except first/last vertex) of G exactly once.
    a) Euler path
    b) Hamiltonian path
    c) Planar graph
    d) Path complement graph
47. Let G(V, E) be a directed graph where every edge has weight as either 1, 2 or 5, what is the algorithm used for the shortest path from a given source vertex to a given destination vertex to get the time complexity of O(V+E)?
    a) BFS
    b) DFS
    c) Binary search
    d) Radix sort
48. QuickSort can be categorized into which of the following?
    a) Brute Force technique
    b) Divide and conquer
    c) Greedy algorithm
    d) Dynamic programming
49. Merge sort uses which of the following technique to implement sorting?
    a) backtracking
    b) greedy algorithm
    c) divide and conquer
    d) dynamic programming
50. What is the average case time complexity of merge sort?
    a) O(n log n)
    b) $O(n^2)$
    c) $O(n^2 \log n)$
    d) $O(n \log n^2)$

UNTI II

51. Which of the following method is used for sorting in merge sort?
    a) merging
    b) partitioning
    c) selection
    d) exchanging
52. Choose the incorrect statement about merge sort from the following?
    a) it is a comparison based sort
    b) it is an adaptive algorithm
    c) it is not an in place algorithm
    d) it is stable algorithm
53. Which of the following is not in place sorting algorithm by default?
    a) merge sort
    b) quick sort
    c) heap sort
    d) insertion sort

54. Choose the correct code for merge sort.

a)

```
void merge_sort(int arr[], int left, int right)
{
   if (left > right)
   {

      int mid = (right-left)/2;
      merge_sort(arr, left, mid);
      merge_sort(arr, mid+1, right);

      merge(arr, left, mid, right); //function to merge sorted arrays
   }
}
```

b)

```
void merge_sort(int arr[], int left, int right)
{
   if (left < right)
   {

      int mid = left+(right-left)/2;
      merge_sort(arr, left, mid);
      merge_sort(arr, mid+1, right);

      merge(arr, left, mid, right); //function to merge sorted arrays
   }
}
```

c)

```
void merge_sort(int arr[], int left, int right)
{
   if (left < right)
   {

      int mid = left+(right-left)/2;
merge(arr, left, mid, right); //function to merge sorted arrays
      merge_sort(arr, left, mid);
      merge_sort(arr, mid+1, right);


   }
}
```

d)

```
void merge_sort(int arr[], int left, int right)
{
```

```
    if (left < right)
    {

        int mid = (right-left)/2;
merge(arr, left, mid, right); //function to merge sorted arrays
        merge_sort(arr, left, mid);
        merge_sort(arr, mid+1, right);


    }
}
```

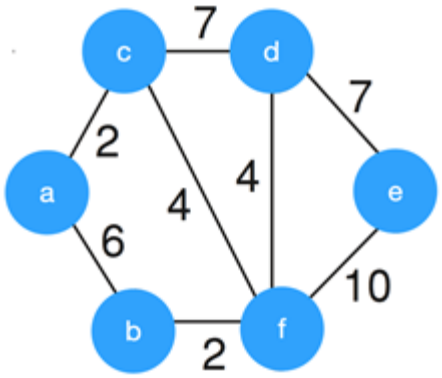
Answer: b

55. Strassen's algorithm is a/an_____ algorithm.
    a) Non- recursive
    b) Recursive
    c) Approximation
    d) Accurate
56. What is the running time of Strassen's algorithm for matrix multiplication?
    a) $O(n^{2.81})$
    b) $O(n^3)$
    c) $O(n^{1.8})$
    d) $O(n^2)$
57. Strassen's matrix multiplication algorithm follows _____ technique.
    a) Greedy technique
    b) Dynamic Programming
    c) Divide and Conquer
    d) Backtracking
58. Strassen's Matrix Algorithm was proposed by _____
    a) Volker Strassen
    b) Andrew Strassen
    c) Victor Jan
    d) Virginia Williams
59. How many iterating statements are involved in the naïve method of matrix multiplication?
    a) 1
    b) 2
    c) 3
    d) 4
60. Depth First Search is equivalent to which of the traversal in the Binary Trees?
    a) Pre-order Traversal
    b) Post-order Traversal
    c) Level-order Traversal
    d) In-order Traversal
61. Time Complexity of DFS is? (V – number of vertices, E – number of edges)
    a) O(V + E)
    b) O(V)

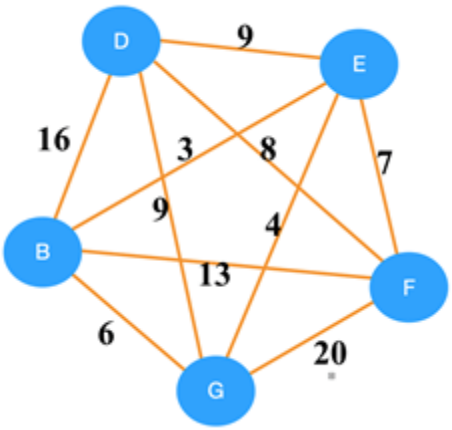
c) O(E)
d) O(V*E)

62. The Data structure used in standard implementation of Breadth First Search is?
    a) Stack
    b) Queue
    c) Linked List
    d) Tree
63. The Depth First Search traversal of a graph will result into?
    a) Linked List
    b) Tree
    c) Graph with back edges
    d) Array
64. A person wants to visit some places. He starts from a vertex and then wants to visit every vertex till it finishes from one vertex, backtracks and then explore other vertex from same vertex. What algorithm he should use?
    a) Depth First Search
    b) Breadth First Search
    c) Trim's algorithm
    d) Kruskal's Algorithm
65. Which of the following is not an application of Depth First Search?
    a) For generating topological sort of a graph
    b) For generating Strongly Connected Components of a directed graph
    c) Detecting cycles in the graph
    d) Peer to Peer Networks
66. When the Depth First Search of a graph is unique?
    a) When the graph is a Binary Tree
    b) When the graph is a Linked List
    c) When the graph is a n-ary Tree
    d) When the graph is a ternary Tree
67. In Depth First Search, how many times a node is visited?
    a) Once
    b) Twice
    c) Equivalent to number of indegree of the node
    d) Thrice
68. Which algorithm is used in graph traversal and path finding?
    a) A*
    b) C*
    c) D*
    d) E*
69. Which algorithm is used to find the least cost path from source node to destination node?
    a) A* BFS
    b) C* BFS
    c) D* BFS
    d) B* BFS

70. Kruskal's algorithm is used to _____
    a) find minimum spanning tree
    b) find single source shortest path
    c) find all pair shortest path algorithm
    d) traverse the graph
71. Kruskal's algorithm is a _____
    a) divide and conquer algorithm
    b) dynamic programming algorithm
    c) greedy algorithm
    d) approximation algorithm
72. Consider the given graph.



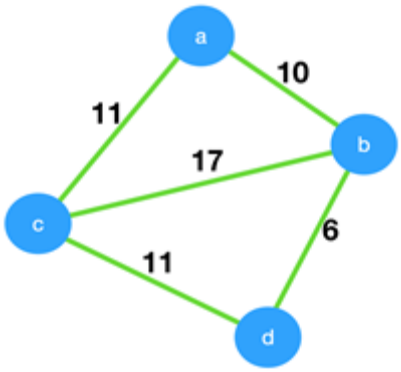
    What is the weight of the minimum spanning tree using the Kruskal's algorithm?
    a) 24
    b) 23
    c) 15
    d) 19
73. Consider the following graph. Using Kruskal's algorithm, which edge will be selected first?



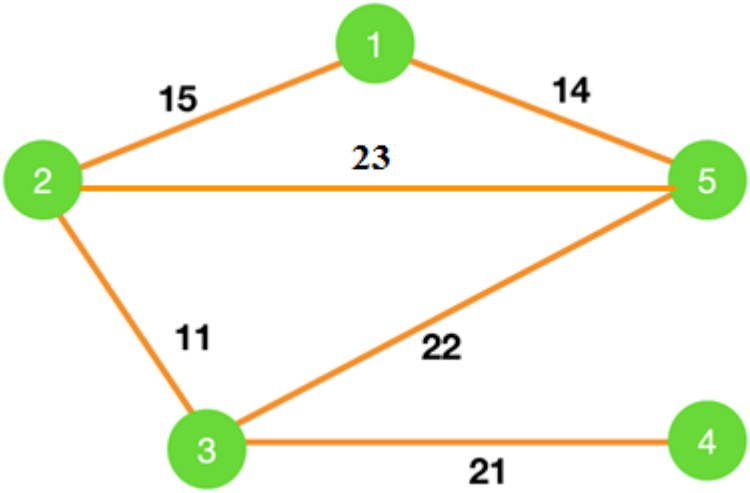
    a) GF
    b) DE
    c) BE
    d) BG
74. Which of the following is true?
    a) Prim's algorithm can also be used for disconnected graphs
    b) Kruskal's algorithm can also run on the disconnected graphs

c) Prim’s algorithm is simpler than Kruskal’s algorithm
d) In Kruskal’s sort edges are added to MST in decreasing order of their weights

75. Which of the following is false about the Kruskal’s algorithm?
a) It is a greedy algorithm
b) It constructs MST by selecting edges in increasing order of their weights
c) It can accept cycles in the MST
d) It uses union-find data structure
76. Consider the following statements.
S1. Kruskal’s algorithm might produce a non-minimal spanning tree.
S2. Kruskal’s algorithm can efficiently implemented using the disjoint-set data structure.
a) S1 is true but S2 is false
b) Both S1 and S2 are false
c) Both S1 and S2 are true
d) S2 is true but S1 is false
77. Which of the following is true?
a) Prim’s algorithm initialises with a vertex
b) Prim’s algorithm initialises with a edge
c) Prim’s algorithm initialises with a vertex which has smallest edge
d) Prim’s algorithm initialises with a forest
78. Consider the given graph.



What is the weight of the minimum spanning tree using the Prim’s algorithm,starting from vertex a?
a) 23
b) 28
c) 27
d) 11
79. Prim’s algorithm is a _____
a) Divide and conquer algorithm
b) Greedy algorithm
c) Dynamic Programming
d) Approximation algorithm
80. Consider the graph shown below.

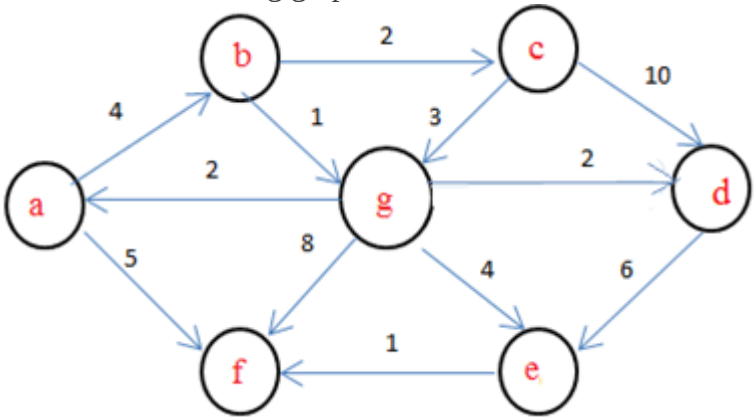


Which of the following edges form the MST of the given graph using Prim'a algorithm, starting from vertex 4.

a) (4-3)(5-3)(2-3)(1-2)
b) (4-3)(3-5)(5-1)(1-2)
c) (4-3)(3-5)(5-2)(1-5)
d) (4-3)(3-2)(2-1)(1-5)

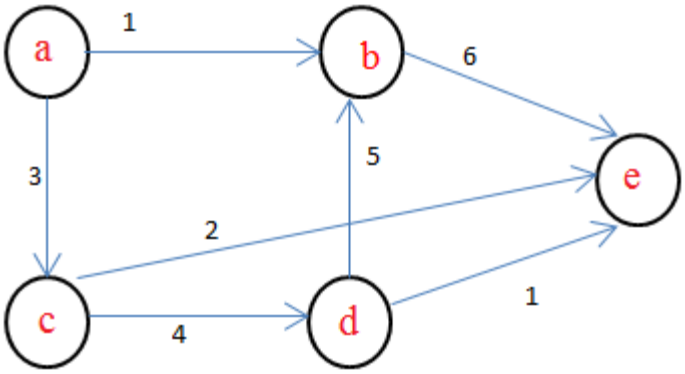
81. Prim's algorithm is also known as _____
    a) Dijkstra–Scholten algorithm
    b) Borůvka's algorithm
    c) Floyd–Warshall algorithm
    d) DJP Algorithm
82. Prim's algorithm can be efficiently implemented using _____ for graphs with greater density.
    a) d-ary heap
    b) linear search
    c) fibonacci heap
    d) binary search
83. Which of the following is false about Prim's algorithm?
    a) It is a greedy algorithm
    b) It constructs MST by selecting edges in increasing order of their weights
    c) It never accepts cycles in the MST
    d) It can be implemented using the Fibonacci heap
84. Dijkstra's Algorithm is used to solve _____ problems.
    a) All pair shortest path
    b) Single source shortest path
    c) Network flow
    d) Sorting
85. 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

86. What is the time complexity of Dijikstra's algorithm?
    a) O(N)
    b) $O(N^3)$
    c) $O(N^2)$
    d) O(logN)
87. 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
88. How many priority queue operations are involved in Dijkstra's Algorithm?
    a) 1
    b) 3
    c) 2
    d) 4
89. How many times the insert and extract min operations are invoked per vertex?
    a) 1
    b) 2
    c) 3
    d) 0
90. 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
91. Consider the following graph.



    If b is the source vertex, what is the minimum cost to reach f vertex?
    a) 8
    b) 9
    c) 4
    d) 6

92. In the given graph, identify the shortest path having minimum cost to reach vertex E if A is the source vertex.



a) a-b-e
b) a-c-e
c) a-c-d-e
d) a-c-d-b-e

93. Dijkstra's Algorithm is the prime example for _____
a) Greedy algorithm
b) Branch and bound
c) Back tracking
d) Dynamic programming

94. Master's theorem is used for?
a) solving recurrences
b) solving iterative relations
c) analysing loops
d) calculating the time complexity of any code

95. How many cases are there under Master's theorem?
a) 2
b) 3
c) 4
d) 5

96. What is the result of the recurrences which fall under first case of Master's theorem (let the recurrence be given by $T(n)=aT(n/b)+f(n)$ and $f(n)=n^c$?
a) $T(n) = O(n\text{^}\log_b a)$
b) $T(n) = O(n^c \log n)$
c) $T(n) = O(f(n))$
d) $T(n) = O(n^2)$

97. Under what case of Master's theorem will the recurrence relation of merge sort fall?
a) 1
b) 2
c) 3
d) It cannot be solved using master's theorem

98. Which case of master's theorem can be extended further?
a) 1
b) 2
c) 3
d) No case can be extended

99. Solve the following recurrence using Master's theorem.
$T(n) = 4T(n/2) + n^2$
a) $T(n) = O(n)$
b) $T(n) = O(\log n)$
c) $T(n) = O(n^2 \log n)$
d) $T(n) = O(n^2)$

100. 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

Unit III

101. 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

102. 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

103. Which of the following statement about 0/1 knapsack and fractional knapsack problem is correct?
a) In 0/1 knapsack problem items are divisible and in fractional knapsack items are indivisible
b) Both are the same
c) 0/1 knapsack is solved using a greedy algorithm and fractional knapsack is solved using dynamic programming
d) In 0/1 knapsack problem items are indivisible and in fractional knapsack items are divisible

104. Given items as {value,weight} pairs {{40,20},{30,10},{20,5}}. The capacity of knapsack=20. Find the maximum value output assuming items to be divisible.
a) 60
b) 80
c) 100
d) 40

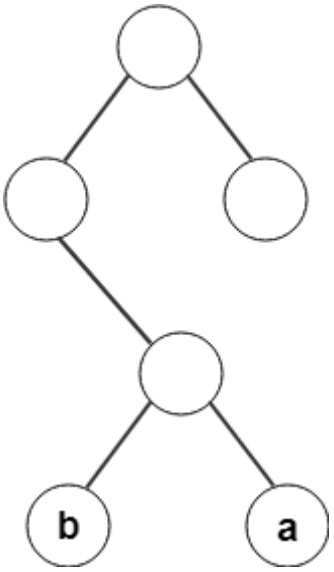
105. The main time taking step in fractional knapsack problem is _____
a) Breaking items into fraction
b) Adding items into knapsack
c) Sorting
d) Looping through sorted items

106. Which of the following algorithms is the best approach for solving Huffman codes?

a) exhaustive search
b) greedy algorithm
c) brute force algorithm
d) divide and conquer algorithm

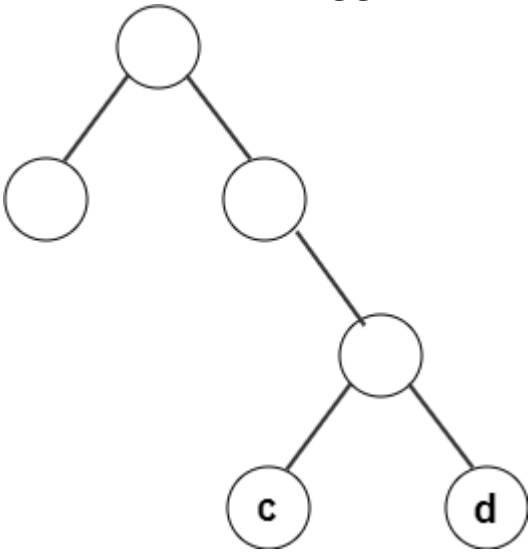
107. In Huffman coding, data in a tree always occur?
a) roots
b) leaves
c) left sub trees
d) right sub trees

108. From the following given tree, what is the code word for the character ‘a’?



a) 011
b) 010
c) 100
d) 101

109. From the following given tree, what is the computed codeword for ‘c’?



a) 111
b) 101

c) 110
d) 011

110. You are given infinite coins of denominations v1, v2, v3,…..,vn and a sum S. The coin change problem is to find the minimum number of coins required to get the sum S. This problem can be solved using _____
a) Greedy algorithm
b) Dynamic programming
c) Divide and conquer
d) Backtracking

111. Suppose you have coins of denominations 1, 3 and 4. You use a greedy algorithm, in which you choose the largest denomination coin which is not greater than the remaining sum. For which of the following sums, will the algorithm NOT produce an optimal answer?
a) 20
b) 12
c) 6
d) 5

112. You are given infinite coins of denominations 1, 3, 4. What is the total number of ways in which a sum of 7 can be achieved using these coins if the order of the coins is not important?
a) 4
b) 3
c) 5
d) 6

113. You are given infinite coins of denominations 5, 7, 9. Which of the following sum CANNOT be achieved using these coins?
a) 50
b) 21
c) 13
d) 23

114. Which of the following methods can be used to solve the Knapsack problem?
a) Brute force algorithm
b) Recursion
c) Dynamic programming
d) Brute force, Recursion and Dynamic Programming

115. Topological sort can be applied to which of the following graphs?
a) Undirected Cyclic Graphs
b) Directed Cyclic Graphs
c) Undirected Acyclic Graphs
d) Directed Acyclic Graphs

116. Most Efficient Time Complexity of Topological Sorting is? (V – number of vertices, E – number of edges)
a) O(V + E)
b) O(V)
c) O(E)
d) O(V*E)

117. . In most of the cases, topological sort starts from a node which has _____
a) Maximum Degree
b) Minimum Degree
c) Any degree
d) Zero Degree

118. Which of the following is not an application of topological sorting?
a) Finding prerequisite of a task
b) Finding Deadlock in an Operating System
c) Finding Cycle in a graph
d) Ordered Statistics

119. Topological sort of a Directed Acyclic graph is?
a) Always unique
b) Always Not unique
c) Sometimes unique and sometimes not unique
d) Always unique if graph has even number of vertices

120. Topological sort can be implemented by?
a) Using Depth First Search
b) Using Breadth First Search
c) Using Depth and Breadth First Search
d) Using level ordered search

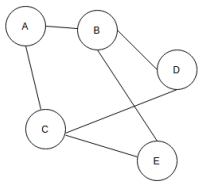
121. Topological sort is equivalent to which of the traversals in trees?
a) Pre-order traversal
b) Post-order traversal
c) In-order traversal
d) Level-order traversal

122. A man wants to go different places in the world. He has listed them down all. But there are some places where he wants to visit before some other places. What application of graph can he use to determine that?
a) Depth First Search
b) Breadth First Search
c) Topological Sorting
d) Dijkstra’s Shortest path algorithm

123. When the topological sort of a graph is unique?
a) When there exists a hamiltonian path in the graph
b) In the presence of multiple nodes with indegree 0
c) In the presence of single node with indegree 0
d) In the presence of single node with outdegree 0

124. Which of the following statements for a simple graph is correct?
a) Every path is a trail
b) Every trail is a path
c) Every trail is a path as well as every path is a trail
d) Path and trail have no relation

125. For the given graph(G), which of the following statements is true?



a) G is a complete graph
b) G is not a connected graph
c) The vertex connectivity of the graph is 2
d) The edge connectivity of the graph is 1

126. What is the number of edges present in a complete graph having n vertices?
a) (n*(n+1))/2
b) (n*(n-1))/2
c) n
d) Information given is insufficient

127.A connected planar graph having 6 vertices, 7 edges contains _____ regions.
a) 15
b) 3
c) 1
d) 11

128. If a simple graph G, contains n vertices and m edges, the number of edges in the Graph G'(Complement of G) is _____
a) (n*n-n-2*m)/2
b) (n*n+n+2*m)/2
c) (n*n-n-2*m)/2
d) (n*n-n+2*m)/2

129. Which of the following properties does a simple graph not hold?
a) Must be connected
b) Must be unweighted
c) Must have no loops or multiple edges
d) Must have no multiple edges

130. Which of the following is true?
a) A graph may contain no edges and many vertices
b) A graph may contain many edges and no vertices
c) A graph may contain no edges and no vertices
d) A graph may contain no vertices and many edges

131.Which of the following ways can be used to represent a graph?
a) Adjacency List and Adjacency Matrix
b) Incidence Matrix
c) Adjacency List, Adjacency Matrix as well as Incidence Matrix
d) No way to represent

132. 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

133. Consider a complete graph G with 4 vertices. The graph G has ____ spanning trees.
a) 15
b) 8
c) 16
d) 13

134. The travelling salesman problem can be solved using _____
a) A spanning tree
b) A minimum spanning tree
c) Bellman – Ford algorithm
d) DFS traversal

135. Consider the graph M with 3 vertices. Its adjacency matrix is shown below. Which of the following is true?

$$M = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

a)Graph M has no minimum spanning tree
b) Graph M has a unique minimum spanning trees of cost 2
c) Graph M has 3 distinct minimum spanning trees, each of cost 2
d) Graph M has 3 spanning trees of different costs

136. 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

137. Which of the following is not the algorithm to find the minimum spanning tree of the given graph?
a) Boruvka's algorithm
b) Prim's algorithm
c) Kruskal's algorithm
d) Bellman–Ford algorithm

138. What is a hash table?
a) A structure that maps values to keys
b) A structure that maps keys to values
c) A structure used for storage
d) A structure used to implement stack and queue

139. If several elements are competing for the same bucket in the hash table, what is it called?
a) Diffusion
b) Replication
c) Collision
d) Duplication

140. What is direct addressing?
a) Distinct array position for every possible key
b) Fewer array positions than keys
c) Fewer keys than array positions
d) Same array position for all keys

141. What is a hash function?
a) A function has allocated memory to keys
b) A function that computes the location of the key in the array
c) A function that creates an array
d) A function that computes the location of the values in the array

142. Which of the following is not a technique to avoid a collision?
a) Make the hash function appear random
b) Use the chaining method
c) Use uniform hashing
d) Increasing hash table size

143. What is the load factor?
a) Average array size
b) Average key size
c) Average chain length
d) Average hash table length

144. What is simple uniform hashing?
a) Every element has equal probability of hashing into any of the slots
b) A weighted probabilistic method is used to hash elements into the slots
c) Elements has Random probability of hashing into array slots
d) Elements are hashed based on priority

145. In simple chaining, what data structure is appropriate?
a) Singly linked list
b) Doubly linked list
c) Circular linked list
d) Binary trees

146. A technique for direct search is
a) Binary Search
b) Linear Search
c) Tree Search
d) Hashing

147. Key value pairs is usually seen in
a) Hash tables
b) Heaps
c) Both Hash tables and Heaps
d) Skip list

148. What is the best definition of a collision in a hash table?
a) Two entries are identical except for their keys
b) Two entries with different data have the exact same key
c) Two entries with different keys have the same exact hash value
d) Two entries with the exact same key have different hash values

149. Which of the following scenarios leads to linear running time for a random search hit in a linear-probing hash table?
a) All keys hash to same index
b) All keys hash to different indices
c) All keys hash to an even-numbered index
d) All keys hash to different even-numbered indices

150. Breadth First Search is used in
a) Binary trees
b) Stacks
c) Graphs
d) trees

151. What is a hash function?
a) A function has allocated memory to keys
b) A function that computes the location of the key in the array
c) A function that creates an array
d) a function that not creates an array

152. Dijkstra's Algorithm is used to solve _____ problems.
a) All pair shortest path
b) Single source shortest path
c) Network flow
d) Sorting

153. 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

154. 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

155. How many priority queue operations are involved in Dijkstra's Algorithm?
a) 1
b) 3
c) 2
d) 4

156. How many times the insert and extract min operations are invoked per vertex?
a) 1
b) 2
c) 3
d) 0

157. Dijkstra's Algorithm is the prime example for _____
a) Greedy algorithm
b) Branch and bound
c) Back tracking
d) Dynamic programming

158. Kruskal's algorithm is used to _____
a) find minimum spanning tree
b) find single source shortest path
c) find all pair shortest path algorithm
d) traverse the graph

159. Which of the following is true?
a) Prim's algorithm can also be used for disconnected graphs
b) Kruskal's algorithm can also run on the disconnected graphs
c) Prim's algorithm is simpler than Kruskal's algorithm
d) In Kruskal's sort edges are added to MST in decreasing order of their weights

160. Which of the following is false about the Kruskal's algorithm?
a) It is a greedy algorithm
b) It constructs MST by selecting edges in increasing order of their weights
c) It can accept cycles in the MST
d) It uses union-find data structure

161. Consider the following statements.
S1. Kruskal's algorithm might produce a non-minimal spanning tree.
S2. Kruskal's algorithm can efficiently implemented using the disjoint-set data structure.
a) S1 is true but S2 is false
b) Both S1 and S2 are false
c) Both S1 and S2 are true
d) S2 is true but S1 is false

162. Which of the following is true?
a) Prim's algorithm initialises with a vertex
b) Prim's algorithm initialises with a edge
c) Prim's algorithm initialises with a vertex which has smallest edge
d) Prim's algorithm initialises with a forest

163. Prim's algorithm is a _____
a) Divide and conquer algorithm
b) Greedy algorithm
c) Dynamic Programming
d) Approximation algorithm

164. Prim's algorithm is also known as _____
a) Dijkstra–Scholten algorithm
b) Borůvka's algorithm
c) Floyd–Warshall algorithm
d) DJP Algorithm

165. Prim's algorithm can be efficiently implemented using _____ for graphs with greater density.
a) d-ary heap
b) linear search
c) fibonacci heap
d) binary search

166. Which of the following is false about Prim's algorithm?
a) It is a greedy algorithm
b) It constructs MST by selecting edges in increasing order of their weights
c) It never accepts cycles in the MST
d) It can be implemented using the Fibonacci heap

167. Floyd Warshall's Algorithm is used for solving _____
a) All pair shortest path problems
b) Single Source shortest path problems
c) Network flow problems
d) Sorting problems

168. Floyd Warshall's Algorithm can be applied on _____
a) Undirected and unweighted graphs
b) Undirected graphs
c) Directed graphs
d) Acyclic graphs

169. The Bellmann Ford algorithm returns _____ value.
a) Boolean
b) Integer
c) String
d) Double

170. What is the basic principle behind Bellmann Ford Algorithm?
a) Interpolation
b) Extrapolation
c) Regression
d) Relaxation

171. Bellmann Ford Algorithm can be applied for _____
a) Undirected and weighted graphs
b) Undirected and unweighted graphs
c) Directed and weighted graphs
d) All directed graphs

172. Bellmann Ford Algorithm is an example for _____
a) Dynamic Programming
b) Greedy Algorithms
c) Linear Programming
d) Branch and Bound

173. The number of elements in the adjacency matrix of a graph having 7 vertices is _____
a) 7
b) 14
c) 36
d) 49