c) When the last statement of function is a recursive call then it is known as tail recursion
d) In implementing recursion stacks are generally used.

62. Choose the statement to be inserted in the following function for insertion of an element into a doubly linked list :

```
struct dlist
{
    int val;
   struct dlist *next;
   struct dlist *prev;
};
void insert(structdlist *x, structdlist *prev)
{
    /*x contains address of the new element */
    x->next=prev->next;
    x->prev=prev;
    /*statements to be inserted here*/
}
```

a) prev->prev=x->next->next=x;
b) prev->next=x->next->next=x;
c) prev->prev=x->next->prev=x;
d) prev->next=x->next->prev=x;

63. Which of the following process is faster for threaded trees compared with their unthreaded counterparts
a) Insertions
b) Deletion
c) Traversal
d) Searching

64. Which of the following traversal techniques lists the elements of a binary search tree in ascending order?
a) Pre-order
b) Post-order
c) In order
d) None of these

65. The depth of a complete binary tree with n nodes
a) log(n+1)-1
b) log(n)
c) log(n-1)+1
d) log(n)+1

66. In a binary search tree, if the number of nodes of a tree is 9, then the minimum height of the tree is
a) 9
b) 5
c) 4
d) none of these

67. Number of possible binary trees with 3 node is
a) 3
b) 2
c) 4
d) 5

68. Total nodes in a 2-tree(Strictly binary tree) with thirty leaves are
a) 60

b) 58
c) 59
d) 57

69. In a height balanced tree, heights of two sub –trees of every node differ by more than
a) 2
b) 0
c) 1
d) -1

70. How many BST can be formed with 1,2,3,4?
a) 1
b) 2
c) 4
d) 6

71. A full binary tree with n non-leaf nodes contains
a) $\log_2$ (n) nodes
b) n+1 nodes
c) 2n nodes
d) 2n+1 nodes

72. A full binary tree with n leaves contains
a) n nodes
b) log n nodes
c) 2n-1 nodes
d) 2^n nodes

73. A binary search tree is generated by inserting in order the following integers:
50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24
The number of nodes in the left subtree and right subtree of the root respectively is
a) (4,7)
b) (7,4)
c) (8,3)
d) (3,8)

74. If a binary tree is threaded for in order traversal a right NULL link of any node is replaced by the address of its
a) successor
b) predecessor
c) root
d) own

75. In a max heap, both the addition and deletion operations can be performed in time
a) O(log n)
b) O(nlog n)
c) O(n)
d) $O(n^2)$

76. In a Heap, the right child of a node in position 10 will be in the position of
a) 20
b) 21
c) 9
d) 5

77. A binary tree may be reconstructed from
a) inorder traversal sequence only
b) preorder traversal sequence only
c) postorder traversal sequence only

d) both inorder and preorder traversal sequence

78. Maximum possible height of an AVL tree with 7 nodes is
    a) 3
    b) 4
    c) 5
    d) 6
79. In traversing non-empty binary tree, visit the root is made in the last in
    a) Preorder traversal
    b) Inorder traversal
    c) Postorder traversal
    d) None of these
80. The in-order and post-order traversal of a binary tree are DBEAFC and DEBFCA respectively. What will be the total number of nodes in the left subtree of the given tree?
    a) 1
    b) 4
    c) 5
    d) none of these
81. A B-tree is
    a) Always balanced
    b) an ordered tree
    c) A directed tree
    d) all of these
82. A Binary tree is a type of tree
    a) That is ordered
    b) b) such that no node has degree more than 2
    c) For which both (a) and (b) above are correct
    d) in which non-leaf nodes will have degree 2
83. In array representation of Binary tree, if the index number of a child node is 6 then the index number of its parent node is
    a) 2
    b) 3
    c) 4
    d) 5
84. In an AVL tree the balancing is needed when balancing factor of any node becomes
    a) 1 or -1
    b) 0 or -1
    c) -2 or 2
    d) -1 or 0
85. The values in a BST can be sorted in ascending order by using which of the following traversals?
    a) Pre-order
    b) In-order
    c) Post-order
    d) Level-order
86. Which tree structure is used for efficient access of records residing in disc memory?
    a) AVL tree
    b) B tree
    c) 2-3 tree
    d) Binary tree
87. A complete directed graph of 5 nodes has…… number of edges
    a) 5

b) 10
c) 20
d) 25

88. Breadth-first-search algorithm uses ……data structure
    a) Stack
    b) Queue
    c) Binary tree
    d) none of these
89. Adjacency matrix of a digraph is
    a) Identity matrix
    b) Symmetric matrix
    c) asymmetric matrix
    d) none of these
90. A graph G with n nodes is bipartite if it contains
    a) n edges
    b) a cycle of odd length
    c) no cycle of odd length
    d) n^2 edges
91. The vertex, removal of which makes a graph disconnected is called
    a) Pendant vertex
    b) Bridge
    c) Articulation point
    d) Colored vertex
92. A vertex of in -degree zero in a directed graph is called
    a) Articulation point
    b) sink
    c) isolated vertex
    d) root vertex
93. BFS
    a) Scans all incident edges before moving to the other vertex
    b) Scans adjacent unvisited vertex as soon as possible
    c) Is same as backtracking
    d) None of these
94. A non-planer graph with minimum number of vertices has
    a) 9 edges, 6 vertices
    b) 6 edges, 4 vertices
    c) 10 edges, 5 vertices
    d) 9 edges, 5 vertices
95. Maximum number of edges in a n-node undirected graph without self loop is
    a) n^2
    b) n(n-1)/2
    c) n-2
    d) (n+1)n/2
96. BFS constructs
    a) a minimal cost spanning tree of a graph
    b) a depth first spanning tree of a graph
    c) a breadth first spanning tree of a graph
    d) none of these
97. A vertex of with degree one in a graph is called
    a) Leaf

b) Pendant vertex
c) End vertex
d) none of these

98. Which method of traversal does not use stack to hold nodes that are waiting to be processed?
a) Breadth- first
b) Depth-first
c) D-search
d) None of these

99. Which data structure is used for depth first traversal of a graph?
a) Array
b) Linked list
c) Stack
d) Queue

100. A simple undirected graph with eight (8) vertices is said to be completed if number of edges equal to
a) 56
b) 28
c) 16
d) 24

101. Any connected graph with x vertices must have at least
a) x+1 edges
b) x-1 edges
c) x edges
d) x/2 edges

102. The element at the root of the heap is
a) largest
b) smallest
c) may be largest or smallest
d) none of these

103. A digraph in which , out degree is same as in degree is called
a) Balanced
b) symmetric
c) regular
d) complete

104. In external sorting technique all data reside in
a) Primary memory
b) Secondary memory
c) both (a) and (b)
d) None of these

105. Which one is the best time among the following algorithms?
a) O(n)
b) $O(\log_2 n)$
c) $O(2^n)$
d) $O(n\log_2 n)$

106. Average case time complexity of quick sort
a) $O(N \log_2 N)$
b) O(N log N)
c) $O(N^2)$
d) $O(N^3)$

107. If $f(n)=1000 n\log n +500n^4 +0.52^n$ then f(n) is

a) $O(n^4)$
b) O(nlog n)
c) $O(2^n)$
d) None of these

108. The complexity of merge sort algorithm is
a) O(n)
b) O(nlog n)
c) $O(n^2)$
d) O(log n)

109. Selection sort and Quick sort both fall into the same category of sorting algorithms. What is this category?
a) O(nlogn) sorts
b) Divide-and-Conquer sorts
c) Interchange sorts
d) Average time is quadratic

110. What is the Big Oh notation of the following expression $F(n)=n \log n^2 + n^2 + e^{\log n}$
a) O(n)
b) $O(n^2)$
c) $O(n \log n^2)$
d) $O(e^{\log n})$

111. A sort which compares adjacent elements in a list and switches where necessary is
a) Insertion sort
b) Heap sort
c) Quick sort
d) Bubble sort

112. Which of the following sorting techniques requires extra space, than the data to be sorted?
a) Selection sort
b) Heap sort
c) Bubble sort
d) None of these

113. Stability of Sorting Algorithm is important for
a) Sorting records on the basis of multiple keys
b) Worst case performance of sorting algorithm
c) Sorting alpha numeric keys as they are likely to be the same
d) None of these

114. The worst case complexity of binary search is
a) O(log n)
b) O(nlog n)
c) O(n)
d) $O(n^2)$

115. Which of the following sorting procedures is the slowest?
a) Quick sort
b) Heap sort
c) Merge sort
d) Bubble sort

116. The best case time complexity of bubble sort technique is
a) O(n)
b) $O(n^2)$
c) O(nlog n)
d) O(log n)

117. Four algo do the same task. Which algo should execute the slowest for large values of n?
   a) $O(n^2)$
   b) O(n)
   c) $O(\log_2 n)$
   d) $O(2^n)$
118. What will be the time complexity for selection sort for an array of n elements?
   a) O(log n)
   b) O(nlog n)
   c) O(n)
   d) $O(n^2)$
119. A machine needs a minimum of 100 sec to sort 1000 names by quick sort. The minimum time needed to sort 100 names will be approximately
   a) 72.7 sec
   b) 11.2 sec
   c) 50.2 sec
   d) 6.7 sec
120. Which of the following algorithm should execute the slowest for large values of N?
   a) O(N)
   b) $O(N^2)$
   c) 9 ($\log_2$ N)
   d) None of these
121. Best case time complexity of insertion sort is
   a) O(1)
   b) O(n)
   c) O(nlog n)
   d) $O(n^2)$
122. A sort, which iteratively passes through a list to exchange the first element with any element less than it and then repeats with a new first element is called
   a) Bubble sort
   b) Quick sort
   c) Heap sort
   d) Selection sort
123. Which of the following shows the correct relationship among some of the more common computing times for algorithm?
   a) $O(\log n) < O(n) < O(n*\log n) < O(2^n) < O(n^2)$
   b) $O(n) < O(\log n) < O(n*\log n) < O(2^n) < O(n^2)$
   c) $O(n) < O(\log n) < O(n*\log n)) < O(n^2) < O(2^n)$
   d) $O(\log n) < O(n) < O(n*\log n) < O(n^2) < O(2^n)$
124. In quick sort, a best /desirable choice of pivot for partitioning the list will be
   a) First element of the list
   b) Last element of the list
   c) Median of the list
   d) A randomly chosen element of the list
125. The time complexity of binary search is
   a) $O(n^2)$
   b) O(n)
   c) O(log n)
   d) O(n log n)
126. The fastest sorting algorithm for an almost already sorted array is
   a) quick sort

b) merge sort
c) selection sort
d) insertion sort

127. For merging two sorted listed of sizes m and n into a sorted list of size m+n, we require comparison of
a) O(m)
b) O(n)
c) O(m+n)
d) O(log(m)+log(n))

128. The running time of an algorithm T(n),where n is the input size is given by
T (n) = 8 T (n/2) +qn, if n>1
= p, if n=1, where p and q are constants.
The order of this algorithm is
a) n^2
b) n^n
c) n^3
d) n

129. Ratio of number of items in hash table , to the table size is called
a) Load factor
b) Item factor
c) Balanced factor
d) All of these

130. Which of the following methods has the best average case complexity for searching?
a) Hashing
b) Sequential
c) Random
d) Binary

131. The technique of linear probing for Collision Resolution can lead to
a) clustering
b) Efficient storage utilization
c) overflow
d) underflow

132. Which of the following is not a requirement of good hashing function?
a) Avoid collision
b) Reduce the storage space
c) Make faster retrieval
d) d) None of these

133. Which of the following is not related to hashing?
a) Synonyms
b) Collision
c) Balance factor
d) Load factor

134. The Linear Probing Technique for collision resolution can lead to
a) Primary clustering
b) Secondary clustering
c) Overflow
d) Efficiency storage utilization

135. The average search time of hashing with linear probing will be less if the load factor :
a) is far less than one
b) equals one