Q.1 If h is any hashing function and is used to hash n keys in to a table of size m, where n<<m, the expected number of collisions involving a particular key x is: 
(A) less than 1. (B) less than n. (C) less than m. (D) less than n/2.
Ans: (A)

Q.2 Let A be an adjacency matrix of a graph G. The \( a_{ij} \) entry in the matrix gives (A) The number of paths of length K from vertex Vi to vertex Vj. (B) Shortest path of K edges from vertex Vi to vertex Vj. (C) Length of a Eulerian path from vertex Vi to vertex Vj. (D) Length of a Hamiltonian cycle from vertex Vi to vertex Vj.
Ans: (B)

Q.3 The OS of a computer may periodically collect all the free memory space to form contiguous block of free space. This is called (A) Concatenation (B) Garbage collection (C) Collision (D) Dynamic Memory Allocation
Ans: (B)

Q.4 What is the following code segment doing?
```cpp
void fn( )
    char c;
    cin.get(c);
    if (c != "\n") {
        fn( );
        cout.put(c);
    }
```
(A) The string entered is printed as it is. (B) The string entered is printed in reverse order. (C) It will go in an infinite loop. (D) It will print an empty line.
Ans: (B)

---

**Ravish Begusarai**

Q.5 You have to sort a list L consisting of a sorted list followed by a few “random” elements. Which of the following sorting methods would be especially suitable for such a task? (A) Bubble sort (B) Selection sort (C) Quick sort (D) Insertion sort
Ans: (D)

Q.6 B Trees are generally (A) very deep and narrow (B) very wide and shallow (C) very deep and very wide (D) cannot say
Ans: (D)

Q.7 A technique for direct search is (A) Binary Search (B) Linear Search (C) Tree Search (D) Hashing
Ans: (D)

Q.8 If a node having two children is deleted from a binary tree, it is replaced by its (A) Inorder predecessor (B) Inorder successor (C) Preorder predecessor (D) None of the above
Ans: (B)

Q.9 The searching technique that takes O (1) time to find a data is (A) Linear Search (B) Binary Search (C) Hashing (D) Tree Search
Ans: (C)

Q.10 A mathematical-model with a collection of operations defined on that model is called (A) Data Structure (B) Abstract Data Type (C) Primitive Data Type (D) Algorithm
Ans: (B)

Q.11 The number of interchanges required to sort 5, 1, 6, 2, 4 in ascending order using Bubble Sort is (A) 6 (B) 5 (C) 7 (D) 8
Ans: (B)

Q.12 The postfix form of the expression (A+B)*((C+D)*E)*F / G is (A) AB+ CD+ E FG /** (B) AB + CD+ E F **G / (C) AB + CD+ E **F *G / (D) AB + CDE * * F *G /
Ans: (A)

Q.13 The complexity of multiplying two matrices of order m*n and n*p is (A) mnp (B) mp (C) mn (D) np
Ans: (A)

Q.14 Merging 4 sorted files containing 50, 10, 25 and 15 records will take time (A) O (100) (B) O (200) (C) O (175) (D) O (125)
Ans: (A)

Q.15 For an undirected graph with n vertices and e edges, the sum of the degree of each vertex is equal to (A) 2n (B) (2n-1)/2 (C) 2e (D) e/2
Ans: (C)

Q.16 In worst case Quick Sort has order (A) O (n log n) (B) O (n^2/2) (C) O (log n) (D) O (n^2/4)
Ans: (B)

Q.17 A full binary tree with 2n+1 nodes contain (A) n leaf nodes (B) n non-leaf nodes (C) n-1 leaf nodes (D) n-1 non-leaf nodes
Ans: (B)

Q.18 If a node in a BST has two children, then its inorder predecessor has (A) no left child (B) no right child (C) two children (D) no child
Ans: (B)
Q.19 A binary tree in which all its levels except possibly the last, have the maximum number of nodes and all the nodes at the last level appear as far left as possible, is known as
(A) full binary tree. (B) AVL tree.
(C) threaded tree. (D) complete binary tree.
Ans:A
Q.20 A linear list of elements in which deletion can be done from one end (front) and insertion can take place only at the other end (rear) is known as a
(A) queue. (B) stack. (C) tree. (D) linked list.
Ans:A
Q.21 What is the postfix form of the following prefix expression -A*B+C$DE
(A) ABCDE*/- (B) A-BCDE*/-
(C) ABC$ED*/- (D) A-BCDE*/
Ans:A
Q.22 A full binary tree with n leaves contains
(A) n nodes. (B) log n 2 nodes.
(C) 2n – 1 nodes. (D) n 2 nodes.
Ans:C
Q.23 A sort which relatively 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) insertion sort. (B) selection sort.
(C) heap sort. (D) quick sort.
Ans:D
Q.24 Which of the following sorting algorithms does not have a worst case running time of \( \binom{2}{n} \) on \( n \)?
(A) Insertion sort (B) Merge sort
(C) Quick sort (D) Bubble sort
Ans:B
Q.25 An undirected graph G with n vertices and e edges is represented by adjacency list. What is the time required to generate all the connected components?
(A) O (n) (B) O (e)
(C) O (e+n) (D) O \( \binom{2}{e} \)
Ans:C
Q.26 Consider a linked list of n elements. What is the time taken to insert an element after an element pointed by some pointer?
(A) O (1) (B) O (log\(n\))
(C) O (n) (D) O (n log\(n\))
Ans:A
Q.27 The smallest element of an array’s index is called its
(A) lower bound. (B) upper bound.
(C) range. (D) extraction.
Ans:A
Q.28 In a circular linked list
(A) components are all linked together in some sequential manner.
(B) there is no beginning and no end.
(C) components are arranged hierarchically.
(D) forward and backward traversal within the list is permitted.
Ans:B
Q.29 A graph with n vertices will definitely have a parallel edge or self loop of the total number of edges are
(A) more than n (B) more than n+1
(C) more than \( \frac{n+1}{2} \) (D) more than \( n(n-1)/2 \)
Ans: D
Q.30 The minimum number of multiplications and additions required to evaluate the polynomial
\[ P = 4x^3 + 3x^2 - 15x + 45 \]
(A) 6 & 3 (B) 4 & 2 (C) 3 & 3 (D) 8 & 3
Ans: C
Q.31 The maximum degree of any vertex in a simple graph with n vertices is
(A) \( n-1 \) (B) n+1 (C) 2n-1 (D) n
Ans: A
Q.32 The data structure required for Breadth First Traversal on a graph is
(A) queue (B) stack
(C) array (D) tree
Ans: A
Q.33 The quick sort algorithm exploit ___________ design technique
(A) Greedy (B) Dynamic programming
(C) Divide and Conquer (D) Backtracking
Ans: C
Q.34 The number of different directed trees with 3 nodes are
(A) 2 (B) 3 (C) 4 (D) 5
Ans: B
Q.35 One can convert a binary tree into its mirror image by traversing it in
(A) inorder (B) preorder
(C) postorder (D) any order
Ans:C
Q.36 The total number of companions required to merge 4 sorted files containing 15, 3, 9 and 8 records into a single sorted file is
(A) 66 (B) 39(C) 15 (D) 3
Ans: 33 (option is not available)
Q.37 In a linked list with n nodes, the time taken to insert an element after an element pointed by
some pointer is
(A) 0 (1) (B) 0 (log n) (C) 0 (n) (D) 0 (n log n)
Ans:A
Q.38 The data structure required to evaluate a
postfix expression is
(A) queue (B) stack (C) array (D) linked-list
Ans:B
Q.39 The data structure required to check whether
an expression contains balanced
parenthesis is
(A) Stack (B) Queue (C) Tree (D) Array
Ans:A
Q.40 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) (D) O(n log n)
Ans:B
Q.41 The number of leaf nodes in a complete
binary tree of depth d is
(A) 2^d (B) 2^(d+1) (C) 2^(d+1) (D) 2d+1
Ans:A
Q.42 What data structure would you mostly likely
see in a nonrecursive
implementation of a
recursive algorithm?
(A) Stack (B) Linked list (C) Queue (D) Trees
Ans:A
Q.43 Which of the following sorting methods would
be most suitable for sorting a list
which is
almost sorted
(A) Bubble Sort (B) Insertion Sort (C) Selection Sort
(D) Quick Sort
Ans:A
Q.44 A B-tree of minimum degree t can maximum
_____ pointers in a node.
(A) t−1 (B) t−1 (C) 2t (D) t
Ans:D
Q.45 The process of accessing data stored in a
serial access memory is similar to
manipulating data
on a
(A) heap (B) queue (C) stack (D) binary tree
Ans:C
Q.46 A graph with n vertices will definitely have a
parallel edge or self loop if the total
number of
edges are
(A) greater than n−1 (B) less than n(n−1)
(C) greater than n(n−1)/2 (D) less than n/2
Ans:A
Q.47 A BST is traversed in the following order
recursively: Right, root, left
The output sequence will be in
(A) Ascending order (B) Descending order
(C) Bitonic sequence (D) No specific order
Ans:B
Q.48 The pre-order and post order traversal of a
Binary Tree generates the same
output. The tree can
have maximum
(A) Three nodes (B) Two nodes
(C) One node (D) Any number of nodes
Ans:C
Q.49 The postfix form of A*B+C/D is
(A) "AB/CD+" (B) "AB*CD/+"
(C) "A*BC+/D" (D) "ABCD/+"
Ans:B
Q.50 Let the following circular queue can
accommodate maximum six elements with the
following data
front = 2 rear = 4
queue = ______; L, M, N, ___ ___
What will happen after ADD O operation takes
place?
(A) front = 2 rear = 5
queue = ______; L, M, N, O, ___
(B) front = 3 rear = 5
queue = L, M, N, O, ___
(C) front = 3 rear = 4
queue = ______; L, M, N, O, ___
(D) front = 2 rear = 4
queue = L, M, N, O, ___
Ans:A
Q.51 A binary tree of depth “d” is an almost
complete binary tree if
(A) Each leaf in the tree is either at level “d” or at
level “d−1”
(B) For any node “n” in the tree with a right
descendent at level “d” all the left
descendents of “n” that are leaves, are also at level
“d”
(C) Both (A) & (B) (D) None of the above
Ans:C
Q.52 A linear collection of data elements where the
linear node is given by means of
pointer is
called
(A) linked list (B) node list (C) primitive list (D) None of these
Ans:A
Q.53 Representation of data structure in memory is
known as:
-------- Ravishbegusarai.wordpress.com --------
(A) recursive (B) abstract data type
(C) storage structure (D) file structure
Ans:B
Q.54 If the address of A[1][1] and A[2][1] are 1000
and 1010 respectively and each
element
occupies 2 bytes then the array has been stored in _________ order.
(A) row major (B) column major
(C) matrix major (D) none of these
Ans:A

Q.55 An adjacency matrix representation of a graph cannot contain information of :
(A) nodes (B) edges
(C) direction of edges (D) parallel edges
Ans:D

Q.56 Quick sort is also known as
(A) merge sort (B) heap sort
(C) bubble sort (D) none of these
Ans:D

Q.57 One of the major drawbacks of B-Tree is the difficulty of traversing the keys sequentially.
(A) True (B) False
Ans:A

Q.58 O(N) (linear time) is better than O(1) constant time.
(A) True (B) False
Ans:B

Q.59 An ADT is defined to be a mathematical model of a user-defined type along with the collection of all __________ operations on that model.
(A) Cardinality (B) Assignment
(C) Primitive (D) Structured
Ans:C

Q.60 An algorithm is made up of two independent time complexities \( f(n) \) and \( g(n) \). Then the complexities of the algorithm is in the order of
(A) \( f(n) \times g(n) \) (B) \( \max( f(n), g(n) ) \)
(C) \( \min( f(n), g(n) ) \) (D) \( f(n) + g(n) \)
Ans:B

Q.61 The goal of hashing is to produce a search that takes
(A) \( O(1) \) time (B) \( O(n^2) \) time
(C) \( O(\log n) \) time (D) \( O(n \log n) \) time
Ans:A

Q.62 The best average behaviour is shown by
(A) Quick Sort (B) Merge Sort
(C) Insertion Sort (D) Heap Sort
Ans:A

Q.63 What is the postfix form of the following prefix
\( +ab\cd \)
(A) \( ab\cd + * \) (B) \( abc\+ * \)
(C) \( ab\+ c\cd - \) (D) \( ab\+c\cd - \)
Ans:A

Q.64 Time complexities of three algorithms are given. Which should execute the slowest for large values of \( N? \)
(A) \( O(2^n) \) (B) \( O(N) \)
(C) \( O(\log N) \) (D) None of these
Ans:B

Q.65 How does an array differ from an ordinary variable?
Ans.

Array Vs. Ordinary Variable
Array is made up of similar data structure that exists in any language. Array is set of similar data types. Array is the collection of similar elements. These similar elements could be all int or all float or all char etc. Array of char is known as string. All elements of the given array must be of same type. Array is finite ordered set of homogeneous elements. The number of elements in the array is pre-specified. An ordinary variable of a simple data type can store a single element only.
For example: Ordinary variable: - int a
Array: - int a[10]

Ravish Begusarai

Q.66 What values are automatically assigned to those array elements which are not explicitly initialized?
Ans.
Garbage values are automatically assigned to those array elements that are not explicitly initialized. If garbage class is auto then array is assumed to contain garbage values. If storage class were declared static or external then all the array elements would have a default initial value as zero.

Q.67 A stack is to be implemented using an array. The associated declarations are:
\[ \text{int stack [100];} \]
\[ \text{int top = 0; } \]
Give the statement to perform push operation.
Ans.
Let us assume that if stack is empty then its top has value -1.
Top ranges from 0 – 99. Let item be the data to be inserted into stack
\[ \text{int stack [100];} \]
\[ \text{int top = 0;} \]
\[ \text{int item;} \]
\[ \text{If (top == 99) \{ \text{Printf ("stack overflow");} \}} \]
\[ \text{Else \{ stack[top++] = item; \}} \]

Q.68 Assume that a queue is available for pushing and popping elements. Given an input sequence \( a, b, c, \) (c be the first element), give the output sequence of elements if the rightmost element given above is the first to be popped from the queue.

--------- Ravishbegusarai.wordpress.com ---------
Printf ("stack overflow");
Else
stack[top++] = item;

--------- Ravishbegusarai.wordpress.com ---------
Q.69 A two dimensional array TABLE [6] [8] is stored in row major order with base address 351. What is the address of TABLE [3] [4]?

Ans. TABLE [6] [8] Base address 351
Let us assume that TABLE[6] [8] is of type integer. The formula for row major form to calculate address is
\[
\text{Loc}(a[i][j]) = \text{base}(a) + w[n(i-lbr) + (j-lbc)]
\]
where
n no. of column in array
w no of bytes per storage location
lbr lower bound for row index
lbc lower bound for column index.
\[
\text{Loc(TABLE}[3][4]) = 351 + 2[8(3-0) + (4-0)]
= 351 + 2[24+4]
= 351 + 56
= 407
\]
Q.70 Which sorting algorithm is best if the list is already sorted? Why?
Ans. Insertion sort as there is no movement of data if the list is already sorted and complexity is of the order O(N)

Q.71 What is the time complexity of Merge sort and Heap sort algorithms?
Ans. Time complexity of merge sort is O(N log₂ N) Time complexity of heap sort is O(nlogn)

Q.72 What is the maximum possible number of nodes in a binary tree at level 6?
Ans. 2^6 = 2 x 2 x 2 x 2 x 2 x 2 = 64
Q.73 A queue is a,
(A) FIFO list. (B) LIFO list. (C) Ordered array. (D) Linear tree.
Ans. (A)

Q.74 Which data structure is needed to convert infix notation to postfix notation?
(A) Branch (B) Queue (C) Tree (D) Stack
Ans. (D)

Q.75 Which of the following operations is performed more efficiently by doubly linked list than by singly linked list?
(A) Deleting a node whose location in given

(B) Searching of an unsorted list for a given item
(C) Inverting a node after the node with given location
(D) Traversing a list to process each node
Ans. (A)

Q.76 The extra key inserted at the end of the array is called a,
(A) End key. (B) Stop key. (C) Sentinel. (D) Transposition.
Ans. (C)

Q.77 The prefix form of A-B/ (C * D ^ E) is,
(A) -/^ACBDE (B) -ABCD^DE (C) -A/B/C^DE (D) -A/B/C^DE
Ans. (C)

Q.78 Consider that n elements are to be sorted. What is the worst case time complexity of Bubble sort?
(A) O(1) (B) O(log² n) (C) O(n) (D) O(n²)
Ans. (D)

Q.79 A characteristic of the data that binary search uses but the linear search ignores is the__________.
(A) Order of the elements of the list. (B) Length of the list. (C) Maximum value in list. (D) Type of elements of the list.
Ans. (A)

Q.80 In Breadth First Search of Graph, which of the following data structure is used?
(A) Stack. (B) Queue. (C) Linked List. (D) None of the above.
Ans. (B)

Q.81 The largest element of an array index is called its
(A) lower bound. (B) range. (C) upper bound. (D) All of these.
Ans. (C)

Q.82 What is the result of the following operation Top (Push (S, X))
(A) X (B) null (C) S (D) None of these.
Ans. (A)

Q.83 How many nodes in a tree have no ancestors.
(A) 0 (B) 1 (C) 2 (D) n
Ans. (B)

Q.84 In order to get the contents of a Binary search tree in ascending order, one has to traverse it in
(A) pre-order. (B) in-order. (C) post order. (D) not possible.
Ans. (B)

Q.85 Which of the following sorting algorithm is stable
(A) insertion sort. (B) bubble sort. (C) quick sort. (D) heap sort.
Ans. (D)
Q.86 The prefix form of an infix expression p + q * r / t is
(A) + pq * rt. (B) +pqr * t .
(C) +pq * rt . (D) + * pqrt .
Ans. (C)

Q.87 Which data structure is used for implementing recursion?
(A) Queue. (B) Stack. (C) Arrays. (D) List.
Ans. (B)

Q.88 In binary search, average number of comparison required for searching an element in a list if n numbers is
(A) log2 n . (B) n / 2 .(C) n. (D) n – 1.
Ans. (A)

Q.89 In order to get the information stored in a Binary Search Tree in the descending order, one should traverse it in which of the following order?
(A) left, root, right (B) root, left, right
(C) right, root, left (D) right, left, root
Ans. (C)

Q.90 The equivalent prefix expression for the following infix expression (A+B)-
(C+D*E)/F*G is
(A) -+AB*/+C*DEFG (B) /-+AB*+C*DEFG
(C) /-+AB*+CDE*FG (D) -+AB*+/CDE*FG
Ans. (A)

Q.91 The time required to delete a node x from a doubly linked list having n nodes is
(A) O (n) (B) O (log n)
(C) O (1) (D) O (n log n)
Ans. (C)

Q.92 Ackerman’s function is defined on the non-negative integers as follows
a (m,n) = n+1 if m=0
= a (m-1, 1) if m≠ 0, n=0
= a (m-1, a(m, n-1)) if m≠ 0, n≠ 0
The value of a (1, 3) is
(A) 4. (B) 5. (C) 6. (D) 7.
Ans. (B)

Q.93 The result of evaluating the postfix expression 5, 4, 6, +, *, 4, 9, 3, /, +, * is
(A) 600. (B) 350. (C) 650. (D) 588.
Ans. (B)

Q.94 The worst case of quick sort has order
(A) O(n^2) (B) O(n) (C) O (n log n) (D) O (log n)
Ans. (A)

Q.95 For an undirected graph G with n vertices and e edges, the sum of the degrees of each vertex is
(A) ne (B) 2n(C) 2e (D) en
Ans. (C)

Q.96 The time required to delete a node x from a doubly linked list having n nodes is
(A) O (n) (B) O (log n)