Data Structure and Algorithm [1102]

Q1. Multiple Choice Questions

1) ---------------- is/are the linear data structures.
    a) Array
    b) Linked List
    c) Stack
    d) All of the above

2) ------------ is a non-linear data structures.
    a) Linked List
    b) Stack
    c) Graph
    d) Queue

3) To traverse an array means
    a) To process each element in an array
    b) To delete an element from an array
    c) To insert an element into an array
    d) To combine two arrays into a single array

4) Merging refers to
    a) Inserting elements into an array
    b) Processing elements of an array
    c) Combining two arrays into single array
    d) Deleting elements from an array

5) Sorting of an array refers to
    a) Processing elements of an array
    b) Deleting elements from an array
    c) Both (a) & (b)
    d) Organizing elements in an array in some order

6) Pick the correct answer
    a) During array declaration, no storage is set aside
    b) Array definition precedes array declaration
    c) Array declaration precedes array definition
    d) Initialization cannot be done during array declaration

7) Which of these best describes an array?
    a) A data structure that shows a hierarchical behavior
    b) Container of objects of similar types
    c) Container of objects of mixed types
    d) All of the mentioned

8) How do you initialize an array in C?
    a) int arr[3] = (1,2,3);
    b) int arr(3) = {1,2,3};

c) int arr[3] = {1,2,3};

d) int arr(3) = (1,2,3);

9) Process of inserting an element in stack is called _____

   a) Create

   b) Push

   c) Evaluation

   d) Pop

10) Process of removing an element from stack is called _____

   a) Create

   b) Push

   c) Evaluation

   d) Pop

11) In a stack, if a user tries to remove an element from empty stack it is called _____

   a) Underflow

   b) Empty collection

   c) Overflow

   d) Garbage Collection

12) Pushing an element into stack already having five elements and stack size of 5 , then stack becomes

   a) Overflow

   b) Crash

   c) Underflow

   d) User flow

13) Entries in a stack are "ordered". What is the meaning of this statement?

   a) A collection of stacks is sortable

   b) Stack entries may be compared with the '<' operation

   c) The entries are stored in a linked list

   d) There is a Sequential entry that is one by one

14) Which of the following applications may use a stack?

   a) A parentheses balancing program

   b) Tracking of local variables at run time

   c) Compiler Syntax Analyzer

   d) All of the mentioned

15) What is the value of the postfix expression 6 3 2 4 + – *:

   a) Something between -5 and -15

   b) Something between 5 and -5

   c) Something between 5 and 15

   d) Something between 15 and 100

16) 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 /

17) What differentiates a circular linked list from a normal linked list?

   a) You cannot have the 'next' pointer point to null in a circular linked list

   b) It is faster to traverse the circular linked list

   c) You may or may not have the 'next' pointer point to null in a circular linked list

   d) All of the mentioned

18) What is the time complexity of searching for an element in a circular linked list?

a) O(n)

b) O(nlogn)

c) O(1)

d) None of the mentioned

19) Which of the following is false about a circular linked list?

a) Every node has a successor

b) Time complexity of inserting a new node at the head of the list is O(1)

c) Time complexity for deleting the last node is O(n)

d) None of the mentioned

20) What is an AVL tree?

a) a tree which is balanced and is a height balanced tree

b) a tree which is unbalanced and is a height balanced tree

c) a tree with three children

d) a tree with atmost 3 children

21) What data structure is used when converting an infix notation to prefix notation?

a) Stack

b) Queue

c) B-Trees

d) Linked-list

22) What would be the Prefix notation for the given equation?
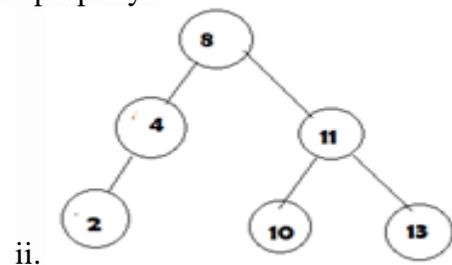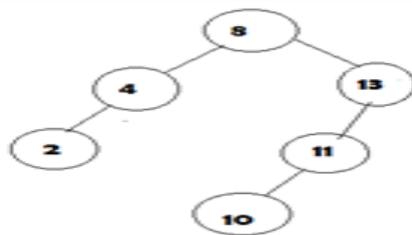A+(B*C)

a) +A*CB

b) *B+AC

c) +A*BC

d) *A+CB

23) The postfix form of A*B+C/D is?

a) *AB/CD+

b) AB*CD/+

c) A*BC+/D

d) ABCD+/*

24) The prefix form of A-B/ (C * D ^ E) is?

a) -/*^ACBDE

b) -ABCD*^DE

c) -A/B*C^DE

d) -A/BC*^DE

25) Which of the below diagram is following AVL tree property?

i.   ii.

a) only i

b) only i and ii

c) only ii

d) none of the mentioned

Q2. Give answers of following in Short.

1) Explain Quick Sort with an example.

2) Explain Binary Search with an example.

3) Compare linear search and binary search algorithm with their complexity.

4) Explain Heap Sort with an example.

5) Explain array types with suitable examples.

6) Explain Insertion Sort with an example.

7) Explain Bubble Sort with an example.

8) Explain Merge Sort with an example.

9) What is an algorithm? Explain its characteristics in detail.

10) Explain different methods to traverse a tree.

11) Show the steps of creating a Binary search tree for the following data –

    15,30,20,5,10,2,7

12) Construct an AVL tree for the following data-
    SAF,CAN, IND, AVG, ENG, WID, SRI, ZIM, NZD, BAN

13) Create a heap with following list of keys:
    8, 20, 9, 4, 15, 10, 7, 22, 3, 12

14) Sort the following list using Heap Sort technique, displaying each step.
    20, 12, 25 6, 10, 15, 13

15) What are B-trees? Construct a B-Tree of order 3 for the following set of
    Input data: 69, 19, 43, 16, 25, 40, 132, 100, 145, 7, 15, 18.

16) Explain dynamic representation of stack.

17) Write an algorithm to convert infix expression to postfix expression.

18) Write an algorithm to convert prefix expression to infix expression.

19) Explain static representation of stack.

20) Draw a B-tree of order 3 for the following sequence of keys:
    2, 4, 9, 8, 7, 6, 3, 1, 5, 10

21) What is quick sort? Sort the following array using quick sort method.
    24 56 47 35 10 90 82 31

22) Write an algorithm to merge two sorted arrays into a third array. Do not

    Sort the third array.

23) Write the programs for Linked List (Insertion and Deletion) operations.

24) List out the areas in which data structures are applied extensively?

25) 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]?

26) How do you find the complexity of an algorithm? What is the relation between the time and space complexities of an algorithm? Justify your answer with an example.

27) What is the difference between a Stack and an Array?

28) What are circular queues? Write down routines for inserting and deleting elements from a circular queue implemented using arrays.

29) What is a Binary Search Tree (BST)? Make a BST for the following sequence of numbers 45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48

Traverse the tree in Preorder, Inorder and postorder.

30) What is a Binary Tree? What is the maximum number of nodes possible in a Binary Tree of depth d. Explain the following terms with respect to Binary trees

(i) Strictly Binary Tree

(ii) Complete Binary Tree

(iii) Almost Complete Binary Tree.

Q3. Write programs for the following

1) Write a program to delete duplicate elements from an array of 20 integers.
2) Write an algorithm to insert a node in the beginning of the linked list.
3) Write a complete program in C to calculate sum of a single linked list nodes.
4) Write functions to do the following operations
   (i) Insert a new node at the end   (ii) Delete the first node
5) Write a procedure to reverse a singly linked list.
6) Write a program to reverse a string using stack.
7) Write a function to remove last node of singly linked list and add it at the beginning.
8) Write a function to merge given two singly linked list.
9) Write a program to calculate Indegree and Outdegree of each node in the graph.
10) Write a program that finds height of Binary tree.
11) Write a function to search element in Binary search tree.
12) Write a program to accept size of stack and add elements onto the stack one by one which are accepted from user until stack is full.
13) Write a C program for Dynamic implementation of stack.
14) Write a C program for Dynamic implementation of queue.
15) Write a program to accept size of queue and add elements onto the queue one by one which are accepted from user until queue is full.
16) Write a program to insert node at specified position in the doubly linked list.
17) Write a program to add a node in the doubly linked list at the beginning and at the end.

18) Write a program to accept 10 numbers from user and sort using heap sort.

19) Write a program to accept 10 numbers from user and sort using quick sort.

20) Write a program to find out maximum from the singly linked list.

Q4. Answer the following in one or two lines

1) What is stack?

2) How to represent a stack?

3) Enlist various applications of stack.

4) List the different stack operations.

5) State the best & worst case time complexity of Quick sort.

6) Which strategy is used to sort data using merge sort?

7) What are applications of linked list?

8) Write node structure of double linked list.

9) Define Linked List.

10) What is circular linked list?

11) What are the advantages of doubly linked list?

12) Differentiate between array and linked list.

13) What is Null tree?

14) Draw a BST for the given data:- 10,34,8,2,40,60

15) Write difference between Binary search tree and AVL tree.

16) Define Algorithm

17) Define Time complexity

18) Define Space complexity

19) Define Big-Oh notation

20) Define Omega notation

21) Define Array

22) Define Spanning tree

23) Height of tree

24) Define Balance factor

25) Define Siblings

26) Define Weighted graph

27) Define Degree of vertex

28) Define Topological sort

29) Which sorting algorithm is best if the list is already sorted? Why?

30) What values are automatically assigned to those array elements which are not explicitly initialized?