

040020102 – Advance Data Structure and Analysis of Algorithm

UNIT : Stack & Queue**Short Questions**

- 1) What is the difference between Data and Information?
- 2) Define Data, Information, and Data Structure.
- 3) List the primitive data structure.
- 4) List the operations performed on Data structure?
- 5) Define Abstract Data Type.
- 6) Define Data Structure.
- 7) Define stack briefly.
- 8) Give real world example of stack.
- 9) List the operations on stack.
- 10) List the application on stack.
- 11) Explain pop operation of stack.
- 12) When the stack is said to be overflow?
- 13) Give the definition of infix notation.
- 14) Give the definition of prefix notation with example.
- 15) Why infix expressions are converted into postfix expressions?
- 16) Write a recursive function in C to compute the factorial of a positive number n.
- 17) What are the rules that must be followed while moving discs from first peg to the third peg in towers of Hanoi problem?
- 18) Why recursion is said to be unnecessary luxury in programming?
- 19) Write algorithm of change operation of stack.
- 20) Compare recursion and iteration.
- 21) Write an algorithm to insert an element into circular queue.

Long Questions

- 1) Explain the Data Structure briefly.
- 2) Explain Stack with its example.
- 3) Explain the operation performed on stack with algorithm.
- 4) Write a short note on multiple stacks.
- 5) List the application of stack. Explain any one application of the stack.
- 6) Write an algorithm to implement stack using linklist.
- 7) Convert the following infix expression into postfix expression: $(A+B^D)/(E-F)+G$
- 8) Explain the method to convert infix to prefix notation with example.
- 9) Write an algorithm to evaluate the postfix notation with example.
- 10) Explain the problem of tower of Hanoi and code to solve the problem using recursion.
- 11) What is the difference between iterative process & recursive process? Which is better between them?
- 12) Define Queue as well as explain queue with operations performed on queue including algorithm.
- 13) Write an algorithm to implement queue using linklist.

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- 14) Explain Circular queue with algorithm.
- 15) Write a short note on Dequeue.
- 16) Difference between circular queue & circular linklist.
- 17) Explain in detail Priority queue.
- 18) List the application of Queue. Explain any one application in detail.
- 19) Write a short note on Simulation.
- 20) Difference between Stack and Queue.

Multiple Choice

- 1) The condition $Top = -1$ indicates that
 - a) Stack is empty
 - b) Stack is full
 - c) Stack has only one element
 - d) None of these
- 2) Example of primitive recursion is :
 - a) Tower of Hanoi
 - b) Ackermann's function
 - c) Both
 - d) None
- 3) Which of the following name does not relate to stacks?
 - a) FIFO lists
 - b) LIFO list
 - c) Piles
 - d) Push-down lists
- 4) Which of the following is the condition of circular queue overflow?
 - a) $Front = 0$ and $Rear = \text{Size of Queue}$
 - b) $Front + 1 = Rear$
 - c) Both a) & b)
 - d) Neither a) nor b)
- 5) The term "push" and "pop" is related to the
 - a) Array
 - b) Lists
 - c) Stacks
 - d) All of above
- 6) A data structure where elements can be added or removed at either end but not in the middle
 - a) Linked lists
 - b) Stacks
 - c) Queues
 - d) Deque
- 7) Which of the following is related to Queue?
 - a) Round Robin Algorithm
 - b) Traffic Control System
 - c) Round Robin Algorithm
 - d) All

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- 8) Which of the following is not an application of stack?
 - a) Evaluation of Polish notation
 - b) Tower of Hanoi
 - c) Stack machine
 - d) None
- 9) In which notation operator comes after operand?
 - a) Infix
 - b) Prefix
 - c) Postfix
 - d) None
- 10) The prefix expression for the infix expression $a * (b + c) / e - f$ is
 - a) $/* a + bc - ef$
 - b) $- / * + abc ef$
 - c) $- / * a + bcef$
 - d) none of the above
- 11) Queue works on the principle:
 - a) First In First Out
 - b) Last in first out
 - c) None
 - d) Both a & b
- 12) Which of the following is the primitive data type?
 - a) Array
 - b) Structure
 - c) Stack
 - d) Long
- 13) Pointer is a non-primitive data type.
 - a) True
 - b) False
- 14) Which of the following is the primitive data type?
 - a) Array
 - b) Structure
 - c) Stack
 - d) Long
- 15) In which of the sorting techniques is a stack used?
 - a) Quick sort
 - b) Bubble sort
 - c) Insertion sort
 - d) Selection sort
- 16) Which of the following is not a type of Dequeue?
 - a) Input Restricted Queue
 - b) Output Restricted Queue
 - c) a & b both
 - d) None
- 17) Which data structure will you use to evaluate prefix notation?

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- a) Queue
 - b) Stack
 - c) Circular Queue
 - d) Array
- 18) Which of the following is not the operation on stack?
- a) Push
 - b) Pop
 - c) Peep
 - d) Enqueue
- 19) In which of the data structure, space for the item is not claimed ,when an item is deleted
- a) queue
 - b) circular queue
 - c) stack
 - d) linked list
- 20) As the items from a queue get deleted, the space for item is not reclaimed in queue. This problem is solved by
- a) circular queue
 - b) stack
 - c) linked list
 - d) doubly linked list
- 21) _____ no. of pointers are required to implement read and write operations in a queue
- a) two
 - b) three
 - c) four
 - d) five

True/False

- 1) Data is only a single value.
- 2) Data and Information both are same.
- 3) Knowledge can be used for data with its attribute.
- 4) Abstract data type is also known as built in data type.
- 5) Recursion is an application of Queue.
- 6) Queue works on the principle First Come First Serve.
- 7) Stack is not an ADT.
- 8) Stack is a Linear Data Structure.
- 9) In Queue insertion and deletion is done at one end called top.
- 10) Insertion is done on one end called front.
- 11) Space utilization is good in Circular Queue as compare to Simple Queue.
- 12) In Input Restricted Queue insertion is done at the both the end but deletion is don't at only one end.
- 13) Police notation is an application of stack.
- 14) Tower of Hanoi is an application of Queue.
- 15) Simulation is modeling of real life problem in the form of a computer program.

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- 16) Traffic control system is an application of Queue.
- 17) Priority is assigned to each element of the queue in Double ended queue.
- 18) Quick sort is based on the Divide and conquer Technique.
- 19) Front and Rear two pointers are maintained in Queue.
- 20) Circular queue and Circular Link list are same.

Fill in the blanks

- 1) _____ is a value or a set of values.
- 2) Processed data is known as _____.
- 3) _____ has certain attributes and which may have certain values.
- 4) Range of the values of an attribute is known as _____.
- 5) ADT stands for _____.
- 6) Stack can be stored in _____ and _____.
- 7) Two pointers for queue are _____ and _____.
- 8) Values are inserted at the both the end of the queue but not in the middle is called _____.
- 9) If front and rear both pointers' values are -1 then Queue is _____.
- 10) If top pointer's value is equal to the size of the stack then Stack is _____.
- 11) The insertion of an element in the stack is known as _____ operation.
- 12) Removing an element from the stack is known as _____ operation.
- 13) When a function definition includes a call to itself, it is referred to as a _____.
- 14) In recursive call to store the value of the variables and the starting address execution is maintained in _____.
- 15) For a queue implemented as an array, the initial value of the front and rear is set to _____.
- 16) The end of the queue from which the element is deleted is known as _____ and the end at which new element is added is known as the _____.
- 17) A _____ is a data structure in which each element is assigned a priority and the elements are added or removed according to that priority.
- 18) _____ is the process of modeling a real life situation through a computer program.
- 19) _____ is a linear list in which elements can be inserted or deleted at either end but not in the middle.
- 20) For a queue implemented as linked list, the initial value of the front and rear is set to _____.

UNIT : Linked Lists**Short Questions**

- 1) What is the limitation of array?
- 2) Define Linked list.
- 3) Explain static representation of linked list.
- 4) What are the advantages of the linked list?
- 5) What are the disadvantages of the linked list?
- 6) List the operations performed on linked list.

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- 7) Define circular linked list.
- 8) What are the problems solved by circular linked list?
- 9) List the advantages of the circular linked list.
- 10) List the disadvantages of the circular linked list.
- 11) Define the doubly linked list.
- 12) List the merits of the doubly linked list.
- 13) List the demerits of the doubly linked list.
- 14) What is the node structure for circular linked list?
- 15) Give at least one real world example linked list.
- 16) List the application of the linked list.
- 17) What is the difference between circular linked list and linear linked list?
- 18) What is the difference between array and linked list?
- 19) Define doubly circular linked list.
- 20) What do you mean by sparse matrix?
- 21) Give the node structure for the term of polynomial having single variable.

Long Questions

- 1) Write a short note on linked list including the storage structure, advantage, and disadvantage.
- 2) Write a pseudo code to add a node in the linked list at the end of the linked list.
- 3) Write a pseudo code to add a node at the front of the linked list.
- 4) Write a pseudo code to add a node at particular position in the linked list.
- 5) Write a pseudo code to add a node after particular node.
- 6) Write a pseudo code to delete a node in the linked list from the end of the linked list.
- 7) Write a pseudo code to delete a node from the front of the linked list.
- 8) Write a pseudo code to delete a node from particular position in the linked list.
- 9) Write a pseudo code to delete a node after particular node.
- 10) Write a pseudo code to traverse in the linked list.
- 11) Explain circular linked list.
- 12) Write a pseudo code to add node at the end in circular linked list.
- 13) Write a pseudo code to delete a node from the circular linked list.
- 14) Write a pseudo code to traverse in the circular linked list.
- 15) Explain doubly linked list including advantage and disadvantage of it.
- 16) Write a pseudo code to add node at the end in doubly linked list.
- 17) Write a pseudo code to delete a node from the doubly linked list.
- 18) Explain doubly circular linked list.
- 19) Write a short note on sparse matrix.
- 20) Write a short note on polynomial manipulation w.r.t. single variable.
- 21) Write a short note on application of linked list.
- 22) Write a pseudo code for implementing stack using linked list.
- 23) Write a pseudo code for implementing queue using linked list.

Multiple Choice Question

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- 1) Linked list are best suited
 - a) for relatively permanent collections of data
 - b) for the size of the structure and the data in the structure are constantly changing
 - c) for both of above situation
 - d) for none of above situation
- 2) In list implementation, a node carries information regarding
 - a) the data
 - b) the link
 - c) the link and the data
 - d) None
- 3) In linked lists there are no NULL links in:
 - a) Single linked list
 - b) Linear doubly linked list
 - c) circular linked list
 - d) None of the above
- 4) Which of the following is the application of the linked list?
 - a) Sparse matrix
 - b) Police notation
 - c) Tower of Hanoi
 - d) All
- 5) Which of the following will contain more memory space?
 - a) Singly Linear Linked List
 - b) Singly circular linked list
 - c) Doubly linked list
 - d) Array
- 6) In Polynomial manipulation, nodes consists of three fields representing
 - a) Coefficient, exponential and link
 - b) Coefficient, data item and the link
 - c) Previous item link, data item and next item link
 - d) None
- 7) A Linked list in which last node contain the link of the first node is called
 - a) Singly linked list
 - b) Doubly linked list
 - c) Circular linked list
 - d) All
- 8) A doubly linked list facilitates list traversal in
 - a) Any direction
 - b) Circular direction
 - c) Either direction
 - d) Single direction
- 9) Which of the following sorting technique is best suited for linked list?
 - a) Insertion sort
 - b) Merge sort
 - c) Heap sort

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- d) Quick sort
- 10) Traversing in a singly linked list is
- Only in one direction
 - In both direction
 - In any direction
 - None
- 11) The situation when in a linked list $START=NULL$ is
- Underflow
 - Overflow
 - Saturated
 - None
- 12) Which of the following is two way lists?
- grounded header list
 - circular header list
 - linked list with header and trailer nodes
 - none of above
- 13) In a linked list, the pointer of the last node contains the special value called _____ linked.
- null
 - linked to the first node
 - link
 - pointer to the tail node
- 14) We can combine the advantage of doubly linked list and circular linked list in _____.
- Two way linked list
 - Two way circular linked list
 - One way linked list
 - Circular one way list
- 15) Which of the following is linear data structure:
- Graph
 - Tree
 - Linked list
 - None
- 16) In which linked list, nodes forms a ring?
- Circular
 - Doubly linked list
 - Singly linked list
 - All
- 17) If some of the data are frequently accessed then which one is better?
- Array
 - Linked list
 - Graph
 - None
- 18) The concatenation of two lists is to be performed in $O(1)$ time. Which of the following implementations of a list could be used?
- Singly linked list

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- b) Doubly linked list
 - c) Circularly doubly linked list
 - d) Array implementation of list
- 19) For merging two sorted lists of sizes m and n into a sorted list of size $m+n$, requires _____ no. of comparisons.
- a) $O(m)$
 - b) $O(n)$
 - c) $O(m+n)$
 - d) $O(\log(m)+\log(n))$
- 20) Given two sorted list of size ' m ' and ' n ' respectively. The number of comparisons needed by the merge sort algorithm will be
- a) $m \times n$
 - b) maximum of m, n
 - c) minimum of m, n
 - d) $m+n-1$
- 21) A linear non primitive structure in which individual elements are joined together by references is known as _____.
- a) Tree
 - b) Linked list
 - c) Graph
 - d) None

True False

- 1) Linked list is primitive data structure.
- 2) Linked list is sequential data structure w.r.t. traversal of the Linked list.
- 3) Linked list is not a sequential data structure w.r.t. memory allocation is concern.
- 4) Linked list is used to store the fixed sized data.
- 5) There is no null linked in circular linked list.
- 6) Traversing is possible in both the direction in singly linked list.
- 7) Circular linked list contains the linked to predecessor as well as successor node.
- 8) Sparse matrix is application of multi linked list.
- 9) Quick sort is best for sorting the data in linked list.
- 10) Linked list can be implemented through array.
- 11) Polynomial manipulation is an application of linked list.
- 12) Infinite loop problem can be arisen in circular linked list.
- 13) Binary search is preferable in linked list.
- 14) Linked list is a collection of data items lined up in a row- in which insertion and deletion is possible in only at front end or back end of the list.
- 15) Linked list is a self referential data structure.
- 16) Stack and queue are constrained version of linked list.
- 17) Random access is possible in a linked list.
- 18) Linked List as compare to array have better cache locality that can make a pretty big difference in performance.
- 19) Doubly linked list may be circular or linear.

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20) A Linked list is a data structure where elements can be added or removed at either end but not in the middle.

Unit : Tree**Short Question**

- 1) Define tree.
- 2) Explain following terms using appropriate example:
 - a. Parent
 - b. Child
 - c. Root
 - d. Leaf
 - e. Level
 - f. Height
 - g. Sibling
- 3) What do you mean by binary tree?
- 4) State difference between binary tree and binary search tree.
- 5) What is the difference between full binary tree & complete binary tree?
- 6) Draw a tree with the given string notation:
(A(B(C(E),F),D),G(H,(I(J))))
- 7) Explain different techniques to represent tree.
- 8) Explain in brief the different operations you can performed on tree.
- 9) Explain tree traversing techniques.
- 10) What are the applications of the tree?
- 11) Write a code to traverse tree in preorder (recursive).
- 12) Write a code to traverse tree in inorder (recursive).
- 13) Write a code to traverse tree in postorder (recursive).
- 14) Explain briefly merge operation of the tree.
- 15) Pre order traversion is depth first search. Justify.
- 16) Explain Decision tree with appropriate example.
- 17) Briefly explain expression tree. Where the expression tree is generally used?
- 18) What do you mean by heap tree? What are the types of the heap tree?
- 19) List the benefits of the threaded binary tree over binary tree.
- 20) Define forest. Also give example of it.

Long Question

- 1) Explain binary tree with its representation including advantage & disadvantage.
- 2) Write a code to insert a node in a binary tree.
- 3) Write a code to delete a node from the binary tree.
- 4) Explain the merge of the tree with example as well as write a code for it.
- 5) Write a code to traverse a tree in preorder without recursion. Also trace the algorithm with appropriate example.
- 6) Write a code to traverse a tree in inorder without recursion. Also trace the algorithm with appropriate example.

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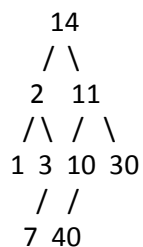
- 7) Write a code to traverse a tree in postorder without recursion. Also trace the algorithm with appropriate example.
- 8) How will you create a binary tree explain with appropriate example? Draw picture for insertion of each node.
- 9) List at least 3 properties of binary tree. Prove any one property of the binary tree.
- 10) Prove that, in a binary tree, the maximum number of nodes on level l is 2^l , where $l \geq 0$.
- 11) Prove that, the maximum number of nodes possible in a binary tree of height h is $2^h - 1$.
- 12) Prove that, the minimum number of node in a binary tree of height h is h .
- 13) Prove that, for any non empty binary tree, if n is the number of nodes and e is the number of edges, then $n = e + 1$.
- 14) For any non empty binary tree T , if n_0 is the number of leaf nodes (degree=0) and n_2 is the number of internal nodes (degree=2), then $n_0 = n_2 + 1$
- 15) The height of a complete binary tree with n number of nodes is $\lceil \log_2(n + 1) \rceil$.
- 16) Create a binary tree using inorder and preorder sequence:
Inorder : D B H E A I F J C G
Preorder: A B D E H C F I J G
- 17) Create a binary tree using inorder and postorder sequence:
Inorder : D B H E A I F J C G
Postorder: D H E B I J F G C A
- 18) Construct an expression tree: $(A - B * C) - (D * E + F / G)$.
- 19) Create a binary tree from the following sequence:
35,45,20,16,42,29,24,33,27
Also delete a node having two children.
- 20) Explain heap tree and also the deletion of a node from a heap tree with appropriate example.
- 21) Write a code to create threaded binary tree.
- 22) Explain threaded binary tree and also write a code to traverse the threaded binary tree.
- 23) Write a short note on weighted binary tree.
- 24) Explain following terms with appropriate example:
 - a) Path length
 - b) External node
 - c) Internal node
 - d) External path length
 - e) Internal path length
 - f) Weighted path length
- 25) Write a short note on decision tree.
- 26) Explain Forest with traversal techniques.

Multiple Choice Questions

- 1) Which of the following data structure is non-linear type?
 - a) Strings
 - b) Lists
 - c) Stacks
 - d) Tree

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- 2) To represent hierarchical relationship between elements, which data structure is suitable?
- Deque
 - Priority
 - Tree
 - All of above
- 3) A binary tree whose every node has either zero or two children is called
- Complete binary tree
 - Binary search tree
 - Extended binary tree
 - None of above
- 4) The depth of a complete binary tree is given by
- $D_n = n \log_2 n$
 - $D_n = n \log_2 n + 1$
 - $D_n = \log_2 n$
 - $D_n = \log_2 n + 1$
- 5) The post order traversal of a binary tree is DEBFCA. Find out the in order traversal
- ABFCDE
 - ADBFEC
 - ABDECF
 - None
- 6) The post order traversal of a binary tree is DEBFCA. Find out the pre order traversal
- ABFCDE
 - ADBFEC
 - ABDECF
 - ABDCEF
- 7) The in order traversal of a binary tree is ABFCD. Find out the pre order traversal
- ABFCD
 - ADBFC
 - ABDCF
 - None
- 8) The in order traversal of tree will yield a sorted listing of elements of tree in
- Binary trees
 - Binary search trees
 - Heaps
 - None of above
- 9) Consider the following tree.



9.1 How many leaves does it have?

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- a) 2
b) 4
c) 6
d) 8
e) 9
- 9.2 How many of the nodes have at least one sibling?
a) 5
b) 6
c) 7
d) 8
e) 9
- 9.3 What is the value stored in the parent node of the node containing 30?
a) 10
b) 11
c) 14
d) none
- 9.4 How many descendants does the root have?
a) 0
b) 2
c) 4
d) 8
- 9.5 What is the depth of the tree?
a) 2
b) 4
c) 8
d) None
- 9.6 How many children does the root have?
a) 6
b) 7
c) 8
d) 9

Fill in the Blanks

- 1) _____ and _____ are non linear data structures.
- 2) Links between two nodes term as _____.
- 3) The number of subtrees of a node node is known as _____.
- 4) These nodes which hang from branches emanating from a node are known a _____ and the node from which the branches emanate is known as _____ node.
- 5) Children of the same parent node are referred to as _____.
- 6) The _____ is the maximum degree of the node in the tree.
- 7) The _____ of a tree is defined to be the maximum level of any node in the tree.
- 8) A _____ is a set of zero or more disjoint tree.
- 9) _____ has the characteristic of all nodes having at most two branches.

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- 10) A binary tree of height which as all its permissible maximum number of nodes is known as _____.
- 11) A binary tree could be represented using a _____ data structure as well as _____ data structure.
- 12) An important operation that is performed on a binary tree is known as _____.
- 13) A traversal is governed by three action _____, _____ and _____.
- 14) A traversal keep moving left in the binary tree until one can move, process the node and moves to the right to continue is called as _____ traversal.
- 15) Left, root, right traversal known as _____ traversal.
- 16) Root, left, right traversal known as _____ traversal.
- 17) Left, right, root traversal known as _____ traversal.
- 18) In _____ algorithm, the deletion procedure is complex.
- 19) _____ is the process of visiting every node in a tree at least once.
- 20) In _____ traversal, the root node is visited last.
- 21) Children of the same parent are called _____.
- 22) Nodes which are subtrees of another node are called _____.
- 23) If a node is a terminal node, then its left child and right child field are filled with _____.

True or False

- 1) Tree is a non linear data structure.
- 2) To represent hierarchical relationship between elements, tree data structure is used.
- 3) Linked between node terms as tree.
- 4) The specially designated node is called root.
- 5) In a tree diagram, a circle represents nodes.
- 6) A tree can represent many-to-many relationships.
- 7) The number of subtrees of a node is known as degree of the node.
- 8) Nodes that have zero degree are known as non terminal nodes.
- 9) Children of the same parent node are referred to as sibling.
- 10) A node of n children should have n values.
- 11) A forest is a set of zero or more disjoint trees.
- 12) A binary tree has the characteristic of all nodes having at most three branches.
- 13) A binary tree which is dominated solely by left child node is called full binary tree.
- 14) Array representation ideally suits a full binary tree due to its non wastage space.
- 15) The tree is accessed by remembering the pointer to the root of the tree.
- 16) In binary tree algorithm, the deletion procedure is complex.
- 17) Traversal is the process of visiting every node in a tree at least once.
- 18) In preorder traversal, the root node is visited first.
- 19) In preorder traversal, the root node is visited last.
- 20) All nodes in a list point to some other node.
- 21) In a binary tree, a node may have a degree greater than 2.

Unit : Sorting**Short Question**

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- 1) Define following terms:
 - a) Sort
 - b) Internal sort
 - c) External sort
 - d) Ascending order
 - e) Descending order
 - f) Lexicographic order
 - g) Collating sequence
- 2) Write down the complexity of the following sort and also note in which situation which sort should be used:
 - a) Insertion sort
 - b) Bubble sort
 - c) Selection sort
 - d) Heap sort
 - e) Shell sort
 - f) Quick sort
 - g) Radix sort
 - h) Merge sort
- 3) Which sorting techniques are an example of divide and conquer?
- 4) Which sorting technique is an application of recursion?
- 5) Which sorting technique is appropriate for linked list?
- 6) Which sorting technique is based on the maximum number of digits in a number?
- 7) Quick sort can be used with large data sorting. True/False. Justify your answer.
- 8) Which sorting technique is better among Insertion sort, bubble sort, selection sort? Why?
- 9) Which sorting is good when your list is nearly sorted list?
- 10) What do you mean by External sort? Give the name of sorting technique for external sort.
- 11) Which sorting techniques use other sorting technique to sort a list?
- 12) What do you mean by stable sort?
- 13) Give the name of at least two stable sorting techniques.
- 14) What do you mean by in place sort?
- 15) Give the name of at least two in place sorting techniques.
- 16) Which sorting technique does not have worst case running time is $O(n^2)$?
- 17) What is the worst case complexity of Quick sort?
- 18) To sort many large object or structures, what would be most efficient?
- 19) Which sorting procedure is the slowest among Quick sort, Heap sort, Shell sort and Bubble sort?
- 20) Which sorting technique compares adjacent elements in a list and switches where necessary?

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Long Question

- 1) Explain working of Insertion sort with example.
- 2) Explain working of Bubble sort with example.
- 3) Explain working of Selection sort with example.
- 4) Explain working of Quick sort with example.
- 5) Explain working of Merge sort with example.
- 6) Explain working of Heap sort with example.
- 7) Explain working of Shell sort with example.
- 8) Explain working of Radix sort with example.
- 9) Explain and also write down the algorithm for Bubble sort.
- 10) Explain and also write down the algorithm for Selection sort.
- 11) Explain and also write down the algorithm for Insertion sort.
- 12) Explain and also write down the algorithm for Merge sort.
- 13) Explain and also write down the algorithm for Shell sort.
- 14) Trace the arrangement of elements in the end of each pass while using bubble-sort for the given list: 5 6 2 9 1 4
- 15) Trace the arrangement of elements in the end of each pass while using insertion sort for given list :22 13 17 15 19 8

Unit: Searching**Short Question**

- 1) What do you mean by searching?
- 2) List different ways for searching.
- 3) Give the name of searching techniques which are external searching techniques.
- 4) List the names of searching techniques which can be used to search non- linear data structure.
- 5) List the names of searching techniques which are of linear type.
- 6) Which searching techniques are of Divide & Conquer?
- 7) What is the complexity of linear search in best case?
- 8) If B tree is having depth d and is of order m, how many maximum keys can be stored in it?
- 9) What is the disadvantage of binary search?
- 10) How B+ tree searching is better than B tree?
- 11) What is the complexity of binary search?
- 12) Which searching technique gives hierarchy searching as well as sequential searching?
- 13) Give one example in which binary search gives $O(1)$ performance.
- 14) In which situation binary search is very useful?
- 15) For linear search in array what is the best case, worst case and average case complexity?

Multiple Choice Questions:

- 1) A sorting technique that guarantees , that records with the same primary key occurs in the same order in the sorted list as in the original unsorted list is said to be
 - a) stable

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- b) consistent
 - c) external
 - d) linear
- 2) What is the worst-case time for serial search finding a single item in an array?
- e) Constant time
 - f) Logarithmic time
 - g) Linear time
 - h) Quadratic time
- 3) What is the worst-case time for binary search finding a single item in an array?
- a) Constant time
 - b) Logarithmic time
 - c) Linear time
 - d) Quadratic time
- 4) Which of the following is not the required condition for binary search algorithm?
- a) The list must be sorted
 - b) There should be the direct access to the middle element in any sub list
 - c) There must be mechanism to delete and/or insert elements in list
 - d) None of above
- 5) Which of the following is not a limitation of binary search algorithm?
- a) Must use a sorted array
 - b) Requirement of sorted array is expensive when a lot of insertion and deletions are needed
 - c) There must be a mechanism to access middle element directly
 - d) Binary search algorithm is not efficient when the data elements are more than 1000.
- 6) Binary search algorithm cannot be applied to
- a) sorted linked list
 - b) sorted binary trees
 - c) sorted linear array
 - d) pointer array
- 7) Which of the following case does not exist in complexity theory
- a) Best case
 - b) Worst case
 - c) Average case
 - d) Null case
- 8) The Worst case occur in linear search algorithm when
- a) Item is somewhere in the middle of array
 - b) Item is not in the array at all
 - c) Item is the last element in the array
 - d) Item is the last element in the array or is not there at all
- 9) The average case occur in linear search algorithm
- a) When item is somewhere in the middle of the array
 - b) When item is not in the array at all
 - c) When item is the last element in the array
 - d) When item is the last element in the array or is not there at all
- 10) The complexity of the average case of an algorithm is

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- a) Much more complicated to analyze than that of worst case
 - b) Much more simpler to analyze than that of worst case
 - c) Sometimes more complicated and some other times simpler than that of worst case
 - d) None or above
- 11) The complexity of linear search algorithm is
- a) $O(n)$
 - b) $O(\log n)$
 - c) $O(n^2)$
 - d) $O(n \log n)$
- 12) The complexity of binary search algorithm is
- a) $O(n)$
 - b) $O(\log n)$
 - c) $O(n^2)$
 - d) $O(n \log n)$
- 13) The complexity of Bubble sort algorithm is
- a) $O(n)$
 - b) $O(\log n)$
 - c) $O(n^2)$
 - d) $O(n \log n)$
- 14) The complexity of insertion sort algorithm is
- a) $O(n)$
 - b) $O(\log n)$
 - c) $O(n^2)$
 - d) $O(n \log n)$
- 15) The complexity of merge sort algorithm is
- a) $O(n)$
 - b) $O(\log n)$
 - c) $O(n^2)$
 - d) $O(n \log n)$
- 16) The number of swapping needed to sort the numbers 8,22,7,9,31,19,5,13 in an ascending order, using bubble sort is
- a) 11
 - b) 12
 - c) 13
 - d) 14
- 17) Queue can be used to implement
- a) radix sort
 - b) quick sort
 - c) recursion
 - d) depth first search
- 18) The average number of comparisons performed by the merge sort algorithm, in merging two sorted lists of length 2 is
- a) $8/3$
 - b) $8/5$

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- c) 11/7
- d) 1/16

Fill in the Blanks

- 1) _____ search is one where a key K is searched for, in a linear list L of data elements.
- 2) Ordered linear search reports a time complexity of worst case is _____ and base case is _____ in terms of key comparisons.
- 3) Unordered linear search reports a time complexity of worst case is _____ and base case is _____ in terms of key comparisons.
- 4) The complexity of linear search algorithm is _____.
- 5) _____ is an algorithm design technique where to solve a problem; the problem is divided in to sub-problems.
- 6) In the case of binary search, the _____ aspect of the technique breaks the list into two sub lists.
- 7) The complexity of binary search algorithm is _____.
- 8) A sorting technique is said to be _____ if keys that are equal retain their relative orders of occurrence even after sorting.
- 9) If the lists of data to be sorted are small enough to be accommodated in the internal memory of the computer, then it is known as _____.
- 10) If the lists of data to be sorted are small enough to be accommodated in external storage device, then it is known as _____.
- 11) The complexity of Bubble sort algorithm is _____.
- 12) The complexity of insertion sort algorithm is _____.
- 13) The average case performance of insertion sort reports _____ complexity.
- 14) _____ and _____ sort is not stable.
- 15) The complexity of selection sort algorithm is _____.
- 16) _____ is a process by which two ordered list of elements are combined into single ordered list.
- 17) The complexity of merge sort algorithm is _____.
- 18) _____ merge sort procedure is built on the design principle of divided and conquers.
- 19) The two-way merge sort principle could be extended to k ordered lists in which case it is termed as _____ merging.
- 20) The complexity of quick sort algorithm is _____.

True or False

- 1) The Sequential Search method on sorted lists is faster than the indexed method.
- 2) The search technique which loads only a part of the database into main memory is known as external search.
- 3) A Binary Search can only be applied to sorted records.
- 4) In Binary Search, when the key is less than the middle element in a sorted array, the higher limit is modified for the next iteration.

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- 5) Binary Search is the fastest of all methods for sorted records.
- 6) The lower limit is modified when the key is greater than the middle element in the array in a binary search method.
- 7) Sorting is always performed on the elements stored in primary memory.
- 8) Minimal storage sorts are optimal for arrays having a large number of elements.
- 9) The process of sorting a list stored in a file in secondary memory is known as internal sorting.
- 10) Methods that are not Data Sensitive require the same time to sort an array.
- 11) The sort is performed according to the key value of each record.
- 12) Bubble Sort is so named because it bubbles the smallest element to the middle of the array.
- 13) Bubble sort is instable sort.
- 14) The complexity of insertion sort is $O(n^2)$
- 15) Selection sort is not stable.
- 16) The Quick Sort Algorithm works by partitioning the array to be sorted, then recursively sorting each partition.
- 17) The insertion sort method is optimal because the sorted array is developed without using any extra storage space.
- 18) Merge sort is not stable.
- 19) Quick sort reports a worst case performance when the list is already in its ascending order.

Long Questions

- 1) Explain linear search with respect to array and linked list. Also write algorithms for each.
- 2) Write an algorithm for binary search and also explain with it with example. What are the necessary conditions for it?
- 3) Write a short note on binary tree searching.
- 4) Explain B tree with appropriate example.
- 5) Explain B+ tree with appropriate example.
- 6) What are the difference between linear search & binary search?
- 7) What are the merits and demerits of the binary search?
- 8) Explain in brief binary tree searching.
- 9) In linked list, which searching technique is better linear search or binary search?
- 10) Write a note on B tree.
- 11) Write a note on B+ tree.
- 12) What are the difference between B tree & B+ tree?
- 13) What are the differences between Binary Tree Search & B tree?
- 14) If one want to print all the key values of the Tree then which searching technique is useful? Justify your answer.

Unit 6: Algorithmic Strategies**Short Question**

- 1) Define algorithm.
- 2) What are the two main criteria to measure the complexity?
- 3) What is an instance of the sorting problem?

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- 4) When is an algorithm correct?
- 5) What is computational problem?
- 6) When is an algorithm incorrect?
- 7) What is a data structure?
- 8) What does the algorithm describe?
- 9) What factors determine which sorting algorithm is best for a particular application?
- 10) Can incorrect algorithms be useful?
- 11) What are some examples of algorithms?
- 12) What two characteristics are common to many interesting algorithmic problems?
- 13) Should every problem solved by algorithms have an easily identified set of candidate solutions?
- 14) What are NP-complete problems?
- 15) Would we have a reason to study algorithms if supercomputers were infinitely fast and computer memory was free?
- 16) Should we consider algorithms as a technology?
- 17) What is the role of algorithms relative to other technologies used in computers?
- 18) Insertion sort uses which approach?
- 19) What is an incremental approach?
- 20) Merge sort uses which technique?
- 21) What notation do you use to describe algorithms?
- 22) What is the running time of an algorithm?
- 23) What is analyzing an algorithm?
- 24) What is a random-access machine (RAM) model?
- 25) What is the key idea of a greedy algorithm?
- 26) How are greedy algorithms better than dynamic programming?
- 27) What is a good example of greedy algorithms?
- 28) What is a downside to greedy algorithms?
- 29) How can we determine if a greedy algorithm is effective?
- 30) What is the activity-selection problem?
- 31) What is the 0-1 knapsack problem?
- 32) How does a problem exhibit an optimal substructure?
- 33) What are three important and more sophisticated techniques used in designing and analyzing efficient algorithms?
- 34) When would we use dynamic-programming?
- 35) When is dynamic-programming effective?
- 36) What is the key technique in dynamic-programming?
- 37) How are greedy algorithms like dynamic-programming algorithms?
- 38) What do we mean by programming in the context of dynamic-programming?
- 39) How does dynamic programming solve problems?
- 40) How is dynamic programming like the divide-and-conquer method?
- 41) How do divide-and-conquer algorithms work?
- 42) How is dynamic programming different that the divide-and-conquer method?
- 43) What are optimization problems?
- 44) What are the steps in developing a dynamic-programming algorithm?

040020102 – Advance Data Structure and Analysis of Algorithm**Long Question**

- 1) Write a note on role of algorithms in computing.
- 2) What kind of problems can be solved by Algorithms?
- 3) What do you mean by pseudo code? Explain pseudo code conventions.
- 4) What do you mean by loop invariant? Prove the correctness of insertion sort using loop invariant.
- 5) Write a note on asymptotic notations.
- 6) Write a note on Divide & conquer method.
- 7) Calculate the complexity of insertion sort.
- 8) Calculate the complexity of merge sort.
- 9) Calculate the complexity of linear search for array.
- 10) Write a note on dynamic programming.
- 11) Write a note on greedy programming.
- 12) Write a difference between dynamic programming & greedy method.
- 13) Explain Assembly line programming.
- 14) Explain Activity selection problem.
- 15) Write a note on Branch and Bound method.

Multiple Choice Questions

- 1) Two main measures for the efficiency of an algorithm are
 - a) Processor and memory
 - b) Complexity and capacity
 - c) Time and space
 - d) Data and space
- 2) The time factor when determining the efficiency of algorithm is measured by
 - a) Counting microseconds
 - b) Counting the number of key operations
 - c) Counting the number of statements
 - d) Counting the kilobytes of algorithm
- 3) The space factor when determining the efficiency of algorithm is measured by
 - e) Counting the maximum memory needed by the algorithm
 - f) Counting the minimum memory needed by the algorithm
 - g) Counting the average memory needed by the algorithm
 - h) Counting the maximum disk space needed by the algorithm
- 4) Which of the following case does not exist in complexity theory
 - a) Best case
 - b) Worst case
 - c) Average case
 - d) Null case
- 5) Which of the following sorting algorithm is of divide-and-conquer type?
 - a) Quick sort
 - b) Insertion sort

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- c) Bubble sort
d) All of above
- 6) A list of n strings, each of length n , is sorted into lexicographic order using the merge-sort algorithm. The worst case running time of this computation is:
- a) $O(n \log n)$
b) $O(n^2 \log n)$
c) $O(n^2 + \log n)$
d) $O(n^2)$
- 7) Dynamic programming divides problems into a number of
- a) conflicting objective functions.
b) decision stages.
c) unrelated constraints.
d) policies.
e) none of the above
- 8) The relationship between stages of a dynamic programming problem is called a(n)
- a) state.
b) random variable.
c) node.
d) Transformation.
e) none of the above
- 9) Match the following

a) All pairs shortest path	a) Greedy
b) Quick sort	b) Depth first search
c) Minimum weight spanning tree	c) Dynamic Programming
d) Connected Component	d) Divide and conquer