Notes and paper helping meterial by Mr Ahsan

cs 301p

important mcqs and points

03028160804

Quicksort – Quicksort is another divide and conquer algorithm. – Quicksort is based on the idea of partitioning (splitting)

The name of the procedure is mergeSort, it is accepting first argument as an array of floats and as second argument as an int. The second parameter is containing the size of the array.

Mergesort is a divide and conquer algorithm that does exactly that. – It splits the list in half – Mergesorts the two halves – Then merges the two sorted halves together – Mergesort can be implemented recursively

N log2 (N) Algorithms N log2 (N) algorithms. These include the following algorithms

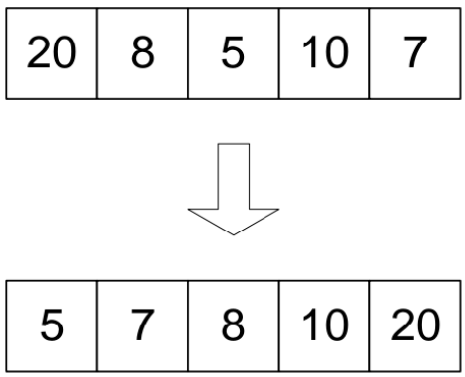
Merge Sort

• Quick Sort • Heap Sort These three algorithms fall under 'divide and conquer category'

Selection Sort– Main idea: o find the smallest element o put it in the first position o find the next smallest element o put it in the second position

Sorting Integers

– *How to sort integers in this array?*



SortingSorting means to put the data in a certain order or sequence

Sorting is so useful that in 80-90% of computer applications

When Hashing is Suitable?

– Hash tables are very good if there is a need for many searches in a reasonably stable table.

Quadratic probing uses different formula:

Use F(i) = i^2 (square of i) to resolve collisions If hash function resolves to H and a search in cell H is inconclusive, try H + 1^2, H + 2^2, H + 3^2, ...

size of our internal array is fixed and we store it in the constant TableSize. In linear probing, at the time of collisions

Collision Collision takes place when two or more keys (data items) produce the same index

$$h(str) = \left(\sum_{i=0}^{length-1} str[i] \right) \% TableSize$$

$$Example : h(ABC) = (65 + 66 + 67) \quad TableSize$$

Another possibility is to convert the string into some number in some arbitrary base b (b also might be a prime number). The formula is as:

$$h(str) = \left(\sum_{i=0}^{length-1} str[i] \times b^{i} \right) \% T$$

$$Example : h(ABC) = (65b^{0} + 66b^{1} + 67b^{2}) \% T$$

Skip List

The skip list is a probabilisitc data structure that is built upon the general idea of a linked list

There are the following types of operations in the skip list.

Insertion operation: used to add a new node to a particular location in a specific situation.

Deletion operation: used to delete a node in a specific situation.

Search Operation: used to search operation is used to search a particular node

There are two types of data structures:

Primitive data structure

Non-primitive data structure

non-primitive data structure is divided into two types:

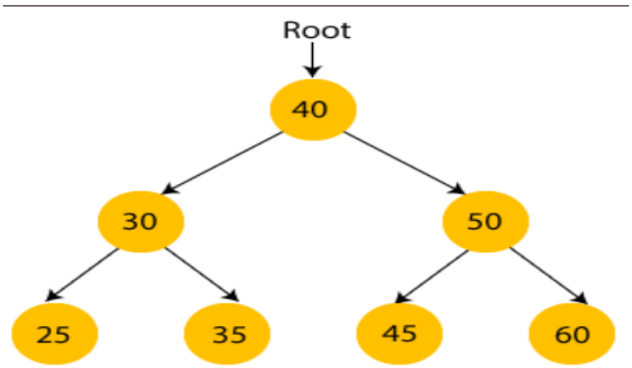
Linear data structure

Non-linear data structure

Skip List Search Insertion in Skip List Deletion from Skip List

Binary tree means that the node can have maximum two children

Searching an Array: Binary Search



Binary Search - Example 1

Binary Tree

binary tree consists of three items:

data item

address of left child

address of right child

Binary Search - Example 2 Binary Search - Example 3 Binary Search – C++ Code Binary Search – Binary Tree

Binary Search - Efficiency

Implementation 3 (of Table ADT): Linked List

Implementation 4 (of Table ADT): Skip List

Skip List - Representation

Skip List - Higher Level Chains Skip List - Formally

Operations on Table ADT

Implementation of Table o Unsorted Sequential Array o Sorted Sequential Array

Priority Queue Using Heap

The Selection Problem

Heap Sort

Disjoint Set ADT Equivalence Relations

getMin Method

buildHeap Method buildHeap in Linear Time

BuildHeap Other Heap methods

C++ Code

Complete Binary Tree

Heap

Max Heap

Insertion in a Heap

Properties of Binary Tree Threaded Binary Trees

Adding Threads During Insert

Where is Inorder Successor?

Inorder Traversal

Hoffman Encoding

Expression tree

Huffman Encoding

Deletion in AVL Tree

Other Uses of Binary Trees

Single Right Rotation

• Single Left Rotation

• Double Right-Left Rotation

• Double Left- Right Rotation

• Deletion in AVL Tree • Cases of Deletion in AVL Tree

AVL Tree Building Example Cases for Rotation

Level-order Traversal of a Binary Tree Storing Other Types of Data in Binary Tree

Binary Search Tree (BST) with Strings

Deleting a Node From BST

Queues

Simulation Models Priority Queue

Queue Operations

The queue data structure supports the following operations:

Operation	Description
enqueue(X)	Place X at the *rear* of the queue.
dequeue()	Remove the *front* element and return it.
front()	Return *front* element without removing it.
isEmpty()	Return TRUE if queue is empty, FALSE otherwise

Infix	Postfix
A + B	A B +
12 + 60 – 23	12 60 + 23 –
(A + B)*(C – D)	A B + C D – *
A ↑ B * C – D + E/F	A B ↑ C*D – E F/+

Josephus Problem

Methods of Linked List Example of list usage Analysis of Link List Doubly-linked List Circularly -linked lists

MCQS

How can we initialize an array in C language?

int arr[2]=(10, 20)

int arr(2)={10, 20}

int arr[2] = {10, 20}

int arr(2) = (10, 20)

Answer C

What is the output of the below code?

```
#include <stdio.h>

int main()

{

  int arr[5]={10,20,30,40,50};

  printf("%d", arr[5]);


   return 0;

}
```

Garbage value

10

50

None of the above

Answer: a

Explanation: The answer is a because the indexing in an array starts from 0, so it starts from arr[0] to arr[4]. If we try to access arr[5] then the garbage value will be printed.

Which one of the following is the size of int arr[9] assuming that int is of 4 bytes?

9

36

35

None of the above

Answer: b

Explanation: The answer is b because the size of int type data is 4 bytes. The array stores 9 elements, so the size of the array is 9*4=36 bytes.

Which one of the following is the process of inserting an element in the stack?

Insert

Add

Push

None of the above

Answer: c

Explanation: The answer is c. In stack, the process

of inserting an element is known as a push operation.

Which data structure is required to convert the infix to prefix notation?

Stack

Linked list

Binary tree

Queue

Answer: a

Which of the following is the infix expression?

A+B*C

+A*BC

ABC+*

None of the above

Answer: a

Which of the following is the prefix form of A+B*C?

+(BC*)

+AB*C

ABC+*

+A*BC

Answer D

The minimum number of stacks required to

implement a stack is __

1

3

2

5

Answer C

Which one of the following is not the type of the Queue?

Linear Queue

Circular Queue

Double ended Queue

Single ended Queue

Answer D

Which of the following sorting algorithms can be

used to sort a random linked list with minimum time complexity?

Insertion Sort

Quick Sort

Heap Sort

Merge Sort

Answer D

The time required to search an element in a linked list of length n is

O (log n)

O (n)

Which data structure is used for implementing recursion?

a) Stack

b) Queue

c) List

d) Array

Answer: a

Which data structure is needed to convert infix notation to postfix notation?

a) Tree

b) Branch

c) Stack

d) Queue

Answer: c

The data structure required for Breadth First Traversal on a graph is?

a) Array

b) Stack

c) Tree

d) Queue

Answer: d

Which data structure is based on the Last In First Out (LIFO) principle?

a) Tree

b) Linked List

c) Stack

d) Queue

Answer: c

Which type of data structure is a ternary heap?

a) Hash

b) Array

c) Priority Stack

d) Priority Queue

Answer: d

What is the maximum height of an AVL tree with p nodes?

a) p

b) log(p)

c) log(p)/2

d) p⁄2

Answer: b

Which of the following is the correct way of declaring an array?

int javatpoint[10];

int javatpoint;

javatpoint{20};

array javatpoint[10];

Answer: a

Which one of the following is the process of inserting an element in the stack?

Insert

Add

Push

None of the above

Answer: c

What is another name for the circular queue among the following options?

Square buffer

Rectangle buffer

Ring buffer

None of the above

Answer: c

Which of the following principle does Queue use?

LIFO principle

FIFO principle

Linear tree

Ordered array

Answer: b

Which of the following is a linear data structure?

array

avl tree

binary tree

graphs

Ans A

Which of the following data structures allow insertion and deletion from both ends?

stack

queue

dequeue

strings

ans C

Which of the following is a Divide and Conquer algorithm?

bubble sort

selection sort

heap sort

mege sort

Ans D

Which data structure do we use for testing a palindrome?

a. Heap

b. Tree

c. Priority queue

d. Stack

Answer: (d)

Which one of the below is not divide and conquer approach?

A - Insertion Sort

B - Merge Sort

C - Shell Sort

D - Heap Sort

Answer : B

Which of the following is not possible with an array in C programming langauge –

A - Declaration

B - Definition

C - Dynamic Allocation

D - Array of strings

Answer : C

Which of the following algorithm does not divide the list –

A - linear search

B - binary search

C - merge sort

D - quick sort

Answer : A

When an array can be declared ?

a) At compile Time

b) At run Time

c) At Compile or Run time

d) In program

Ans: c)

Which data structure stores the elements in FIFO (first in first out) principle?

Queue

Stack

Array

Tree

Ans A

Which data structure stores the elements in LIFO (last in first out) principle?

Queue

Stack

Linked list

Array

Ans B

part B

If we use array to implement list, then there is an issue that it gives difficulty when:

Select the correct option

We will increase its size #

We will access values randomly

We will reduce its size ##

We will remove data from it

Correct A

sometimes queues do not follow FIFO order

Select the correct option

Simple

Double Ended #

Priority##

Circular

Correct B

A list is the collection of items of the

Select the correct option

May be of the same or may be of a different type

different type

same type

Structure type

Correct B

isEmpty() method of stack class will return true when:

Select the correct option

Stack is not empty nor full

Stack is empty

Stack is full

Stack is partially empty

Correct B

The order of operands in postfix is the.... _as that in the infix.

Select the correct option

Same

Unusual

None of the above

Different

Correct A

Circular Linked List always has NULL pointer/s in a node

Select the correct option

1

2

3

O

Correct d

In singly linked list a node comprises of field/s

Select the correct option

Three

One

Two

Four

Correct C

When an executable program runs, it is loaded in the computer memory and becomes a_.

Select the correct option

Thread

Process

h file

None of the above

Correct B

Which of the following functions does not belong to the stack class?

Select the correct option

top()

push()

pop()

crash()

Correct D

Which of the following represents the frequency of all characters in the Huffman Encoding tree?

Select the correct option

Root Node

Left Branch

Leaf Node

Right Branch

Correct C

Consider a min heap, represented by the following

array.

5,6,8,9,7

After deleting the root node. Which of the following is the updated min heap?

Select the correct option

6,8,9,7

6,7,9,8

8,7,9,6

6,7,8,9

Correct D

A complete binary tree with a property that the value at each node is at least as small as the values in its children are called as

Select the correct option

Min Heap

Binary search tree

Binary tree

Max Heap

Correct A

A hole is created which needs to be filled if the element is from the heap.

Select the correct option

Deleted

There is no concept of hole in heap

Updated

Inserted

Correct A

We can use & symbol with data type.

Select the correct option

Any

User Defined

Integer

Float

Correct C

The following function is used for function call by.

```
int func (int& a) {
return a;
}
```

Select the correct option

Value

Pointer

Reference

Template

Correct C

Which of the following represents the destructor of Binary Search Tree class?

Select the correct option

BinarySearchTree() -

BinarySearchTree() ##

void -BinarySearchTree() #

-BinarySearchTree()

Correct C

A tree will be an AVL tree if..... of the tree fulfills the AVL condition.

Select the correct option

Leaf nodes

Non-leaf nodes

Root node

Every

Correct C

A complete binary tree with a property that the value at each node is at least as small as the values in its children are called as

select the correct option

Binary search tree

Binary tree

Min Heap

Max Heap

Correct C

Which of the following nodes has the maximum value in a max heap?

Select the correct option

None of the given options.

Root node

Right eldest child

Left most child

Correct B

A Hole Is Created Which Needs To Be Filled If The Element Is from the Heap.

Select the Correct Option

There is no concept of hole in heap

INSERTED

Deleted

Updated

Correct C

Consider a max heap, represented by the following array:

49, 39, 36, 31, 27, 21, 35, 12

After the deletion of node with value 49. Which of the following is the updated max heap?

Select the correct option

39, 36, 31,27, 21, 35, 12

39, 36, 35,21, 27, 31, 12

39, 36, 31,12, 27, 21, 35

39, 31, 36,12, 27, 21, 35

Correct B

In a complete binary tree the number of nodes at level 5 are

Select the correct option

32

16

31

15

Correct A

objects (objects accessed by pointers) are called anonymous objects.

Select the correct option

Friend

Private

Public

Nameles

Correct D

In a program a reference variable with name 'x' can be declared as

Select the correct option

int *x;

int &x;

int x;

int &x= any_other_integer_variable;

Correct B

In level-order traversal for Binary Search Tree,data structure is used

Select the correct option

Queue

Linked List

Heap

Stack

Correct A

The symbol is used when we want to get the value of a variable using a pointer.

Select the correct option

::

&

||

*

The balance of a node in a binary search tree is defined as the

Select the correct option

height of its left subtree - height of its right subtree###

height of its right subtree-height of root node

height of its right subtree + height of its left subtree

height of its left subtree-height of its leaf nodes

Correct A

Which of the following represents the destructor of Binary Search Tree class?

Select the correct option

BinarySearchTree() -

void -BinarySearchTree()

BinarySearchTree()

-BinarySearchTree()

Correct B

Which of the following is visited at the last step in the post-order traversal method?

Select the correct option

Right Node

Leaf Node #

Root Node##

Left Node

Correct B

Which of the following is a reserved keyword of C++?

Select the correct option

add

remove

define

del

Correct D

If the data is given in sorted order, the generated tree will be similar to

Select the correct option

Heap

Stack

Queue

Linked list

Correct D

Which traversal method should be maintained when a node is deleted from a Binary Search Tree?

Select the correct option

Post-Order

Pre-Order

Level Order

In-Order

Correct D

If the data is given in sorted order, the tree generated will be similar to

Select the correct option

Heap

Stack

Queue

Linked list

Correct D

Which of the following functions returns a const value?

Select the correct option

void EType& findMin(const int a);

void EType& findMin(const int a) const; ##

int EType& findMin() const;

const EType& findMin() const;

Correct B

Binary Search Tree Class Is Defined As A Template Class So that it can be used for Datatype (s).

Select the Correct Option

Strings

Character

Any

Integer

Correct C

Recursion is performed with the help of data structure

Select the correct option

Stack

Queue

Linked List

Binary Tree

Correct A

A complete binary tree has 7 non-leaf nodes, The number of leaf nodes will be:

Select the correct option

6

7

9

8

Correct D

The Depth of A Complete Binary Tree is 6, The Number of Its Non-Leaf Nodes Will Be:

Select the Correct Option

60

63

64

61

Correct B

We can make a lexicographic order of characters

based on their

Select the correct option

Binary digits

Memory addresses

ASCII values

Random choice

Correct C

Left, right, info, and parent are the operations of data structure.

Select the correct option

Linked List

Queue

Tree

Stack

Correct B

In the perspective of memory organization every process executing, the last part of the memory is for the..... of the program.

Select the correct option

Stack

Date

Heap

Code

Correct A

Nodes in the linked list are accessed in..... order:

Select the correct option

Sequential

Non-linear

Descending

Random

Correct A

The result of the postfix expression 632*+ is

Select the correct option

18

30

20

25

Correct C

Which type of linked list has two Null pointers?

Select the correct option

None of the given options

Doubly linked list

Singly linked list

Linkes list

Correct B

In Linked List, add () method will add the new node after

Select the correct option

Middle node

Current node

Last Current node

None of the given options

Correct B

Which of the following is used to navigate from one node to another node in the linked list?

Select the correct option

Object field of node

Next part of node

parent node

None of the given options

Correct B

In stack, which node will be considered as the Top of stack?

Select the correct option

Middle node

First node

Third node

Last node

Correct b

If the data is given in sorted order, the tree generated will be similar to___

Select the correct option

Stack

Linked list

Queue

Heap

Correct B

A tree will be an AVL tree if..... of the tree will fulfill the AVL condition

Select the correct option

Root node

Leaf nodes

Non-leaf nodes

Every

Correct D

If an expression tree is correct then its root should have,

Select the correct option

)

(

an operand

an operator

Correct D

IT IT IS NeESSARY FOR HUffman Encoding Tree to Be,

Select the Correct Option

Binary Tree

Binary Search Tree

None of the given

Complete Binary Tree

Correct A

IF BOH POINTERS OF THE NODE IN A BINARY TREE ARE NULL THEN WILL BE A/An

Select the Correct Option

Leaf Node

Root node

Inner Node

None of the Given Options

Correct A

We implement the heap by

Select the correct option

AVL tree

Expression tree

Complete binary tree

Threaded Tree

Correct C

Which of the following queues does not always follow FIFO behavior?

Select the correct option

Double-ended queue

Circular queue

Simple queue

Priority queue

Correct D

The..... Level of Any Leaf in A Binary Tree is Called The Depth of the Tree

Select the Correct Option

Zero

Mid

Minimum

Maximum

Correct C

Which of the following memory portions is used to dynamically allocate the memory?

Select the correct option

Queue

Code

Heap

Stack

Correct C

We can use & symbol with data type.

Select the correct option

User Defined

Any

Float

Integer

Correct B

We can calculate the of a subtree by counting its levels from the bottom.

Select the Correct Option

Data Items

Height

BALANCE

Nodes

Correct B

..... is the Maximum Height of the Avl Tree.

Select the Correct Option

1.44Log2n

4.44Log2n

log2n

1.44

Correct A

Level-order traversal for Binary Search Tree can be implemented,

Select the correct option

Only through non-recursive method

Through both recursive method call and non-recursive method call

Through max-heap

Only through recursive method

Correct D

We allocate memory dynamically by using..... operator.

Select the correct option

increment

this

new

decrement

Correct C

While implementing stack with an array and to achieve LIFO behavior, we used push and pop elements at

Select the correct option

The start of the array.

The end of the array.

At least one position before array starting index.

The middle of the array.

Correct B

length() method of List class is used to:

Select the correct option

Return the length of the empty part of the array

Return the length of empty part of the list

Return the length of the array

Return the length of the list

Correct D

"new int[11]" will allocate memory for integers.

Select the correct option

12

11

13

10

Correct B

Which Operation of Queue Data Structure is used to get front element from the queue and then remova it from the queue?

Select the Correct Option

Dequeue ()##

Enqueue () #

Front ()

Remove ()

Correct B

If we want to return the first element of the list which one method will be used.

Select the correct option

Get():

Peek():

start():

Set();

Correct C

In BST the is used to delete a node I.E. EITHER Left Child or Right Child.

Select the Correct Option

Case 1

Case 2

Case 3

Case 4

Correct B

While implementing stack with an array and to achieve LIFO behavior, we used push and pop elements at

Select the correct option

The start of the array.

The end of the array. ##

At least one position before array starting index.

The mid of the array.

Correct B

Factorial Is An Example of..... Function.

Select the Correct Option

Recursive

Non-Recursive

both

double recursive

Correct A

The..... of a binary tree is the maximum level of its leaves (also called the depth).

Select the correct option

Level

Width

Height

frequency

Correct C

Each node in singly linked list contains_

Select the correct option

One pointer

Two pointers

Three pointers

Four pointers

Correct A

Which of the following can be used to reverse a string value?

Select the correct option

Stack

Queue

Linked List

Array

Correct A

Level of any node is..... Than/to the Level of its Parent Node.

Select the Correct Option

One More

One Less

Two more

Double

Correct A

The structure of the tree with data is like a linked list.

Select the correct option

sorted

unsorted

Queue

Default

Correct A

Which kind of data structure is used to evaluate postfix expression?

Select the correct option

Tree

Queue

Linked List

Stack

Correct D

Josephus problem is resolved by the implementation of_

Select the correct option

Circular linked list

Stack

Queue

Linked List

Correct A

Clear() of a list is used to

Select the correct option

remove current element

remove last element

remove all elements

remove first element

Correct C

In node class one field is an integer data and other field will be

Select the correct option

Pointer to class

pointer to a list

Pointer to node

Pointer to integer

Correct C

First Element of An Int Array Can Be Manipulated by Using The Index Zero As

Select the Correct Option

O [int];

A [0];

00:

Int [0]: #

Correct D

What of Following Represents Frequency of All Characters Huffman Encoding Tree?

Select the Correct Option

Left Branch

Right Branch

Leaf Node

Root node

Correct C

Where to put inline function during the frequent calling inside the program from multiple source files?

Select the correct option

Outside the class

main()

Header File

Inside the class.

Correct C

In C++,..... function is used to write a character into a file while---

is used to get a character from a file.

Select the correct option

putc(), getc()

getc(), putc()

tellg(), seekg()

seekg(), tellg()

Correct A

The bit manipulation operator..... is used to set a specific bit.

Select the correct option

&

A

*

I

Correct D

A constructor with arguments is known as.

Select the correct option

Destructor

Default Constructor

Parameterized Constructor

Virtual Constructor

Correct C

In C++, when accessing files randomly, which

function is used to get the current pointer position inside a file?

Select the correct option

tellg() ##

seekg()

seekp()

tellp()

Correct A

Which is not a preprocessor directive of C-language?

Select the correct option

#if

#endif

#startif

#else

Correct C

is a user-defined data type.

Select the correct option

Class

Function

Pointer

Constructor

Correct A

In C++, which operator is used to access the data members of the class?

Select the correct option

Not

Plus

Dot

And

Correct C

In disjoint sets, union is a time operation.

select your correct option.

Constant

Variable

Alphabet

Exponential

Correct A

Which of the following is the most significant part of compilers?

(select your correct option)

AVL tree

Expression tree

Array

Binary Search Tree

Correct B

Hash function can reduce searching operation to..... in its best and average cases.

(select your correct option)

Constant time

Linear time

Algorithmic time

Delay time

Correct C

"++" is a--------operator

(select your correct option)

Unary

Binary

Ternary

decimal

Correct B

In threaded binary tree, every node that does not have a left-child has a thread to its

(select your Correct Option)

In-ORDER Successor

Pre-ORDER Successor

In-ORDER Predecessor

In-ORDER replace

Correct C

Which of the following stack operations could result in stack underflow?

(select your correct option)

is_empty

pop

push

start

Correct B

If a complete binary tree has n number of nodes then its height will be,

Answer (Please select your correct option)

Loga (n+1)-1 #

2n

Loga (n) - 11

2-1

Correct A

If the tree becomes unbalanced after deleting a node then we use to rebalance it.

Select the correct option

Heap

Stack

Rotations

Insertions

Correct C

Bool data type takes..... values.

Select the correct option

0#

1#

2

3

Correct A

When overloading assignment (=) operator, which of the following syntax is correct?

Select the correct option

void operator (=) (const String &s);

void operator = (const String &s); ###

void operator (=) const String &other;

void operator (= String &s);

Correct B

Which option will be correct in order to free the space of memory allocated to a buffer (buf)?

Select the correct option

delete buf

remove buf

strcpy buf

free buf

Correct A

In the syntax of the overloaded operator function given below:

Complex operator + (Complex &);

What is 'operator'?

Select the correct option

Object

Keyword

Class

Operand

Correct B

1. The Position in A Queue From

which an element is deleted is

CALLED AS

top

Front ##

rear

mid

Correct B

4. In A Stack, Insertion is Done AT

Top

front

rear

mid

Correct A

5. Which of the Following Data Structure is linear type?

Stack

graph

Trees

Binary Tree

Correct A

2. Which of the following
data structure can't store
the nonhomogeneous data
elements?

Arrays
Stacks
queue
None of the above

Correct A

6. The position in a queue from which an element is

deleted is called as

Top

Front

Rear

Mid

Correct B

2. Reverse Polish notation is the other name of

Infix expression

Prefix expression

Postfix expression

Algebraic expression

Correct C

4. A data structure that can store related information together is called

Array

String

About Structure

All of the above

Correct A

5. Which function insert an element on the stack?

Pop()

Push()

Peek()

isEmpty()

Correct B

8. Which Function Delete An Element on the stack?

Pop ()

PUSH ()

Peek ()

isempty ()

Correct A

5. Which data structure is needed to convert infix notation to postfix

notation?

Branch

Tree

Queue

Stack

Correct D

3. In which linked lists there areno NULL links

single linked list

linear doubly linked list

circular linked list ##

linked list

Correct C

9. Linked list is considered as an type of

example of memory allocation.

Dynamic

Static

Compile time

Heap

CorrectA

2. Which data structure can be used to test a palindrome?

Tree

Heap

Stack

Priority queue

Correct C

Auxiliary Space Requirement of Sleep

sort is

O (N)

0 (1)

O (MAX (INPUT))

O (Log N)

Correct B

Which of the following methods is the best choice for complex applications?

binary heap

d-heap

treap

pairing heap

Correct D

9. A linear list in which the last
node points to the first node

singly linked list
circular linked list
doubly linked list
none of the above

Correct B

1. The Term "Push" and "Pop" is Related to the

Array
List
stacks

All of Above

correct C