

## Data Structure

classmate

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Q.1 A) Answer the following.

1. What is Use of tell()?

→ It is used to return the current file position of a given file.

2. Which function is used to close the currently opened file?

→ fclose()

3. The Omega Notation is used when the function  $g(n)$  defines a lower bound for the function  $f(n)$ .

.1 B) Answer in Brief.

1. Define Big-Oh notation.

→ The notation  $O(n)$  is the formal way to express the upper bound of an algorithm's running time. It measures the worst-case time complexity or the longest amount of time an algorithm can possibly take to complete. For any value of  $n$ , the running time of an algorithm does not cross the time provided by  $O(g(n))$ .

```
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{  
    pstr[i] = i+1;  
    printf("The Elements of the array: ");  
    for(i=n; i<m; i++)  
    {  
        printf("%d", pstr[i]);  
    }  
    getch();  
}
```

Q.1 A) Answer the following

1. What is use of fopen()?

→ Create a new file or open an existing file.

2. Which function is used to close the currently opened file?

→ fclose() is used to close the currently opened file.

3. Using remove() we can't remove text from file.

→ false.

Q.1 B) Answer in Brief.

1. What is file handling?

→ The process of accessing files from a

Particulars Program is known as file handling.

file handling also known as file I/O

C Programming language provides access to high level functions as well as low level (OS level) calls to handle files on your storage devices.

I c) Answer in Brief.

I Write a Program code to copy content of one file into another file.

```
#include <stdio.h>
#include <conio.h>
void main()
{
    FILE * fptr1, * fptr2;
    char filename[100];
    int c;

    printf("Enter File Name: ");
    scanf("%s", filename);

    fptr1 = fopen(filename, "r");
    if (fptr1 == NULL)
    {
        printf("Cannot open file %s", filename);
    }
}
```

```
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printf("Enter the filename to writing: ");  
scanf("%s", filename);  
fptr12 = fopen(filename, "w");  
if (fptr12 == NULL)  
{  
    printf("Cannot open file %s", filename);  
}  
while (cc = fgetc(fptr12)) != EOF)  
{  
    fputc(cc, fptr12);  
}  
printf("Contents copied %s", filename);  
fclose(fptr11);  
fclose(fptr12);  
return 0;  
}
```

Q.2 A) Answer the following.

1. Bucket Sorting method is also known as bin sort.
2. In Selection Sorting techniques it compare each element of the list with element next to it.
3. List the sorting techniques based on divide and conquer approach.  
→ Merge sort

Q 2 B) Answer in Brief.

- 1 Explain shell sort techniques.
- The shell sort algorithm is a sorting algorithm that sorts by comparing and moving pairs of elements first apart in a list or array.

Q 2 C) Answer in Brief.

- 1 Explain bucket sort techniques with Example.
- Bucket sort or bin sort is a sorting method that can be used to sort a list of numbers by its base.
- That sorts the elements by first dividing the elements into several groups called buckets.
- The elements inside each bucket are sorted using any of the suitable sorting algorithms or recursively calling the same algorithm.
- A number of buckets are created. Each bucket is filled with a specific range of elements.
- The elements inside the bucket are sorted using any other algorithm.
- finally, the elements of the bucket are gathered to get the sorted array.

Example:

```
#include <stdio.h>
#include <conio.h>
```

Q.2 B) Answer in Brief

1 Write an algorithm for bubble sort.

→ Let "a" be an array of n numbers. "temp" is a temporary variable for swapping the position of the numbers.

Step 1: Input n numbers for an array "a".

Step 2: Initialize i=0 and repeat through step 4 if ( $i < n$ )

Step 3: Initialize j=0 and repeat through step 4

Step 4: if ( $a[i] > a[j+1]$ );

    temp =  $a[i]$ ;

$a[i] = a[j+1]$ ;

$a[j+1] = temp$ ;

Step 5: Display the sorted numbers of array a.

Step 6: Exit.

Q.2 C) Answer in Brief.

1 What do you mean by searching? Explain binary search with example.

→ Searching means the process of finding a desired element in a set of items.

→ The desired element is called "target."

The set of items to be searched in can be any data-structure like - list, array, linked-list, tree or graph.

→ Based on the type of search operation, these algorithms are generally classified into two categories.

- i) Sequential Search ii) Linear Search
- iii) Interval Search

→ Binary Search also known as half-interval Search. This search algorithm works on the principle of divide and conquer. Binary search compares the target value to the middle element of the array. If they are not equal, the half in which the target cannot lie is eliminated and the search continues on the remaining half, again taking the middle element to compare to the target value, and repeating this until the target value is found.

Example :

```
void main()
{
    int n,i, arr[50], search, first, last, middle;
    clrscr();
    printf("Enter total number of Elem: ");
    scanf("%d", &n);
    printf(" Enter %d number: ", n);
    for (i=0; i<n; i++)
    {
        printf(" arr[%d]: ", i);
        scanf(" %d", &arr[i]);
    }
}
```

Q. 3 A) Answer the following:

1. FIFO stands for First In First Out.
2. LIFO stands for Last In First Out.
3. Convert infix to postfix:  $a^b / (c^d) + e$ .  
→  $ab^1 / ab^1 (cd^*)e + 7$

Q. 3 B) Answer in Brief.

1. Explain recursion with stack.  
→ Recursion is the technique of solving any problem by calling the same function again and again until some breaking condition where recursion stops and it starts calculating the solution from there on. Recursion is extremely useful and extensively used because many problems are elegantly specified or solved in a recursive way.

Q. 3 C) Answer in Brief.

1. Write an algorithm step for push, pop and display operation of stack.

→ Push:

Step 1: check if the stack is full.

Step 2: If the stack is full, produce an error and exit.

Q.4 A) Answer the following.

1. Linked list is known as linear data types.
2. Singly linked list can be performed traversal in both direction.
3. How many fields are available in Doubly Linked list ? name them.  
→ Link carries a data fields and two link fields called next and prev.

Q.4 B) Answer the following.

1. What is header linked ? Explain types of header linked list.  
→ A header linked list is a type of linked list that uses a special header node to represent the beginning of the list. The header node is actually a dummy node with no actual data but it then acts as a reference point to the first node in the list.

Two types of header linked list

- 1) Grounded header linked list
- 2) Circular header linked list

Q.4 c) Answer in Brief.

7. Write a menu driven program to create singly linked list with following operation: Create(), Insertfirst(); Deletefirst(); Display();

```
#include <stdio.h>
#include <conio.h>
struct node
{
    int data;
    struct node *next;
};
struct node *head;
void insertfirst();
void deletefirst();
void create();
void display();
void main()
{
    int choice=0;
    while (choice != 9)
    {
        printf("\n--- Menu Driven ---");
        printf(" choose one option:");
        printf("\n1. Create \n2. Insertfirst\n3. display \n4. delete first");
        printf("\nEnter your choice:");
        scanf (" %d", &choice);
        switch (choice)
        {
```

```
case 1:  
    create();  
    break;  
case 2:  
    Insertfirst();  
    break;  
case 3:  
    display();  
    break;  
case 4:  
    deletefirst();  
    break;  
case 5:  
    exit(0);  
    break;  
default:  
    printf("Please Enter valid choice ..");
```

{}

void Insertfirst()

{

struct node \*ptri;

int item;

ptri = (struct node\*) malloc (sizeof(struct node));

if (ptri == NULL)

{

printf("In OVERFLOW");

{

else

{

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```
    printf("In Enter Value:");
    scanf("%d", &item);
    ptmp->data = item;
    ptmp->next = head;
    head = ptmp;
    printf("In Node inserted");
}

void deletefirst()
{
    struct node *ptmp;
    if (head == NULL)
    {
        printf("In List is Empty");
    }
    else
    {
        ptmp = head;
        head = ptmp->next;
        free(ptmp);
        printf("In Node Deleted");
    }
}

void create()
{
    struct node *head;
    int data;
    head = (struct node *)malloc(sizeof(struct node));
    printf("Enter the data: ");
    scanf("%d", &data);
```

Q.4 A) Answer the following.

1. A linked list there is no need for pointers available.
2. Singly linked list can be performed traversal in both direction.
3. Each entry in a linked list is called node.
4. B) Answer in Brief.

7. Define linked list.

- A linked list is a linear collection of data elements whose order is not given by their physical placement in memory.

C) Answer in Brief.

Write a menu driven program to create singly linked list with following operations

```
head->data = data;  
head->next = NULL;  
temp = head;  
for (i=2; i<=4; i++)
```

```
{ Node=(struct node*)malloc(sizeof(struct  
node));
```

```
printf("Enter the data: ", i);
```

```
scanf("%d", &data);
```

```
newNode->data = data;
```

```
newNode->next = NULL;
```

```
temp->next = node;
```

```
temp = temp->next;
```

{}

```
void display()
```

{

```
struct node *ptr;
```

```
ptr = head;
```

```
if (ptr == NULL)
```

{

```
printf("Nothing to Print");
```

{}

```
else
```

```
{ printf("\n Printing Values ..\n");
```

```
while (ptr != NULL)
```

{

```
printf("\n %d", ptr->data);
```

```
ptr = ptr->next;
```

{}

{}

Q. 3 B) Answer in Brief.

1. Define Priority Queue:

- A Priority Queue is a special type of queue in data structure where each element is associated with a priority. In this queue, elements with higher priority are dequeued before the elements with lower priority. If two elements carry the same priority, they are served as per their ordering in the queue.

Q. 3 C) Answer in Brief.

1. Explain types of data structure.

- There are two types of data structure.

i) Primitive Data Structure:

The primitive data structures use primitive data types. The int, char, float, double, and pointer are the primitive data structures that can hold a single value.

ii) Non-Primitive Data Structure:

The non-primitive data structure is divided into two types:

i) Linear Data Structure

ii) Nonlinear Data Structure

Step 3: If the stack is not full, increment the  
top to point to the next empty space.  
Step 4: Adds data element to the stack.  
Step 5: Return success.

Pop :

Step 1: check if the stack is empty.  
Step 2: if the  $\text{tos} < 0$ , produce an error.  
Step 3: If the stack is not empty, access the  
data element at which top is pointing.  
Step 4: Decrease the value of top by 1.  
Step 5: Return success.

Display :

Step 1: if ( $\text{tos} < 0$ ) - stack is empty.  
Step 2: else  
for ( $i = \text{tos}; i \geq 0; i--$ )  
    printf "element that is stack[i]"  
Step 3: End.

Q.3 A) Answer the following.

1. In queue elements are inserted from end.

2. Which method is use to remove element from the stack?

→ POP method

3. If  $\text{tos} = -1$  then stack is empty.

```
    printf("Enter a number to find: ");
    scanf("%d", &search);
    first = 0;
    last = n-1;
    middle = (first + last) / 2;
    while (first <= last)
    {
        if (array[middle] < search)
        {
            first = middle + 1;
        }
        else if (array[middle] == search)
        {
            printf("Element %d is found at
location %d \n", search, middle+1);
            break;
        }
        else
        {
            last = middle - 1;
            middle = (first + last) / 2;
        }
        if (first > last)
        {
            printf("Not found! %d is not
present in the list", search);
        }
    }
    getch();
```

Q. 2

```
void main()
{
    int data[100], n, i;
    printf("Enter size of array: ");
    scanf("%d", &n);
    printf("Enter array Elements: ");
    for (i=0; i<n; i++)
    {
        printf("data[%d]", i);
        scanf("%d", &data[i]);
    }
    bucketSort(data, n);
    printf("Sorted array in ascending: ");
    for (i=0; i<n; i++)
    {
        printf("%d", data[i]);
    }
    getch();
}
```

2 A) Answer the following.

- 1 List the sorting techniques based on divide and conquer approach.  
Merge Sort.

Sequential Search is also known as Linear Search

Bucket sorting method is also known as bin sort.

```
int getmax(int arr[], int size)
{
    int max = arr[0];
    int i;
    for (i=1; i<size; i++)
        if (arr[i] > max)
            max = arr[i];
    return max;
}
```

```
void bucketsort(int arr[], int size)
{
    int bucket[100];
    int i, j;
    const int max = getmax(arr, size);
    for (i=0; i<=max; i++)
    {
        bucket[i] = 0;
    }
    for (i=0; i<size; i++)
        bucket[arr[i]]++;
    for (i=0; j=0; i<=max; i++)
    {
        while (bucket[i] > 0)
        {
            arr[j++] = i;
            bucket[i]--;
        }
    }
}
```

Q.1 c) Answer In Brief.

1. Write a Program Explain dynamic memory allocation functions with example.

→ "Malloc" function is use to allocate the memory.  
"memory allocation" method is used to dynamically allocate a single large block of memory with the specified size.  
It return a pointer of type void which can be cast into a pointer of any form.

Example:

```
#include <stdio.h>
#include <conio.h>
#include <stdlib.h>
Void main()
{
    int *ptr, n, i;
    clrscr();
    printf("Enter number of Elements:");
    scanf("%d", &n);
    ptr = (int *) malloc(n * sizeof(int));
    if (ptr == NULL)
    {
        printf("Memory not allocated");
    }
    else
    {
        printf("Memory allocated.");
        for (i=0; i<n; i++)
    }
```

Q.5 A) Answer in Brief.

1. BST stands for Binary Search Tree
2. MST stands for Minimum Spanning tree
3. Tree is non-linear hierarchical type of data structure

Q.5 B) Answer in Brief.

1. Define B-tree

→ A binary tree is a tree-type non-linear data structure with a maximum of two children for each parent.

A binary tree is an important class of a tree data structure in which a node can have at most two children.

Every node in a binary tree has a left and right reference along with the data.

5 c) Answer in Brief.

1. What do you mean by traversal of tree? Explain tree traversal methods in details.

→ Traversal is the method of techniques to display data in a binary tree.

→ Unlike linear data structures Array, Queue, which have only one logical way to traverse them, can be traversed in different ways.

following are the generically used ways for traversing trees.

- 1) Depth First Traversals:
  - Inorder
  - Preorder
  - Postorder

- 2) Breadth First or Level Order Traversal

Q.5 A) Answer the following.

1. DFS stands for Depth First Search.
2. The root node has does not have parent node.
3. Tree is nonlinear type of data structure.

Q.5 B) Explain the basic terminologies of binary tree

→ Binary tree is a special types of tree data structure in which every node can have a maximum of 2 children.

One is known as left child and the other is known as right child. A tree in which every node can have a maximum of two children is called as binary tree.

Q.5 : (c) Answer in Brief.

2. Explain adjacency list and adjacency matrix representation of graph.