

Practical No.10

/*

○ PROBLEM STATEMET:-

Read the marks obtained by students of second year in an online examination of particular subject. Find out maximum and minimum marks obtained in that subject. Use heap data structure. Analyze the algorithm.

*/

```
#include<iostream>
using namespace std;
#define MAX 10
class Heap
{
    private:
        int Marks[MAX];
        int n;

    public:
        Heap();
        void insert(int num);
        void makeheap();
        void heapsort();
        void display();
        void display_max_min_marks();
};

Heap::Heap()
{
    n=0;
    for(int i=0;i<MAX;i++)
        Marks[i]=0;
}

void Heap::insert(int num)
{
    if(n<MAX)
    {
        Marks[n]=num;
        n++;
    }
    else
```

```

        cout<<"\nArray is full...";
    }

void Heap::makeheap()
{
    for(int i=1;i<n;i++)
    {
        int val=Marks[i];
        int j=1;
        int f=(j-1)/2;
        while((j>0) && Marks[f]<val)
        {
            Marks[j]=Marks[f];
            j=f;
            f=(j-1)/2;
        }
        Marks[j]=val;
    }
}

void Heap::heapsort()
{
    for(int i=n-1;i>0;i--)
    {
        int temp=Marks[i];
        Marks[i]=Marks[0];
        int k=0;
        int j;
        if(i==1)
            j=-1;
        else
            j=1;
        if(i>2&&Marks[2]>Marks[1])
            j=2;
        while(j>=0&&temp<Marks[j])
        {
            Marks[k]=Marks[j];
            k=j;
            j=2*k+1;
            if(j+1<=i-1&&Marks[j]<Marks[j+1])
                j++;
            if(j>i-1)
                j=-1;
        }
        Marks[k]=temp;
    }
}

void Heap::display()
{
    for(int i=0;i<n;i++)

```

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        cout<<" "<<Marks[i];
    cout<<"\n";
}

void Heap::display_max_min_marks()
{
    cout<<"\nThe Maximum marks="<<Marks[n-1];
    cout<<"\nThe Minimum marks="<<Marks[0];
    cout<<"\n";
}

int main()
{
    Heap obj;
    obj.insert(55);
    obj.insert(48);
    obj.insert(89);
    obj.insert(91);
    obj.insert(75);
    obj.insert(63);
    obj.insert(45);
    obj.insert(78);
    cout<<"\nFollowing Marks are obtained by students...."<<endl;
    obj.display();
    obj.makeheap();
    cout<<"\n\nHeapified....."<<endl;
    obj.heapsort();
    obj.display_max_min_marks();
    return 0;
}

```

Output:

Following Marks are obtained by students....

55 48 89 91 75 63 45 78

Heapified.....

The Maximum marks=91

The Minimum marks=45