**Institute of Engineering & Management**

**Department of Computer Science & Engineering**

**Data Structure Laboratory for 2nd year 3rd semester 2017**

**Code: CS 392**

**Date:**

**ASSIGNMENT-5(Continued)**

**Problem-2**

**Problem Statement:** Implement Heap sort using an array

**Algorithm:** Step 1: Start  
 Step 2: Take input some numbers and store them in an array ‘a’.  
 Step 3: Set hs=total no of elements, i=(hs-1)/2  
 Step 4: Repeat step 5 to step 11 until hs becomes less than 0  
 Step 5: Repeat step 6 to step 8 until I becomes less than 0  
 Step 6: If a[i] is less than a[2i+1] (its left children in a binary tree) then swap a[i] with it, else don’t Swap.  
 Step 7: If a[i] is less than a[2i+2] (its right children in a binary tree) then swap a[i] with it, else don’t swap.  
 Step 8: Set i=i-1  
 Step 9: Swap a[0] with a[hs-1]  
 Step 10: Set hs=hs-1  
 Step 11: Set i=0 & repeat step 5 to step 7  
 Step 12: Print the array  
 Step 13: End

**Source code:** #include <stdio.h>  
#include <stdlib.h>  
  
void build\_heap(int \*,int);  
void heapify(int \*, int, int);  
void heapsort(int \*, int \*,int);  
void display(int \*, int);  
void swap(int \*,int \*);  
  
void main()  
{  
 printf("Enter the number of elements\n");  
 int count, i;  
 scanf("%d", &count);  
 int heap[count];  
 printf("Enter the numbers with with spaces between them\n");  
 for(i=0;i<count;i++)  
 scanf("%d", &heap[i] );  
 build\_heap(heap, count);  
 int arr[count];  
 heapsort(arr, heap, count);  
 display(arr, count);  
}  
  
void build\_heap(int \*heap, int count)  
{  
 int i;  
 for(i=count-1;i>=0;i--)  
 heapify(heap, i, count);  
}  
  
void heapify(int \*heap, int i, int count)  
{  
 int \*large=NULL;  
 if((2\*i+1)<count){  
 if(heap[i]<heap[2\*i+1])  
 large=&heap[2\*i+1];  
 else large=&heap[i];  
 }  
 if((2\*i+2)<count) {  
 if(\*large<heap[2\*i+2])  
 large=&heap[2\*i+2];  
 }  
 if(large!=&heap[i] && large!=NULL){  
 swap(large, &heap[i]);  
 heapify(heap, (large==&heap[2\*i+1])? 2\*i+1 : 2\*i+2 , count);  
 }  
}  
  
void heapsort(int \*arr,int \*heap, int count)  
{  
 int i;  
 for(i=count-1;i>=0;i--){  
 swap(heap, &heap[i]);  
 arr[i]=heap[i];  
 heapify(heap, 0, i);  
 }  
}  
  
void swap(int \*ptr1, int \*ptr2)  
{  
 int temp;  
 temp=\*ptr1;  
 \*ptr1=\*ptr2;  
 \*ptr2=temp;  
}  
  
void display(int \*arr, int count)  
{  
 printf("The sorted array is \n");  
 while(count--){  
 printf("%d, ",arr[count]);  
 }  
}

**Input/Output:** Enter the number of elements  
5  
Enter the numbers with with spaces between them  
2 1 5 3 4  
The sorted array is  
1, 2, 3, 4, 5,