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
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Enter the numbers with with spaces between them
2 1 5 3 4
The sorted array is
1, 2, 3, 4, 5,