DSA LAB PROGRAMS

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1.. Write a program for the Insertion sort algorithm?

```
/* C program for Insertion Sort */

#include <stdio.h>
int main()
{
   int n, i, j, temp;
   int arr[64];

   printf("Enter number of elements\n");
   scanf("%d", &n);

   printf("Enter %d integers\n", n);
   for (i = 0; i < n; i++)
   {
      scanf("%d", &arr[i]);
   }
   for (i = 1 ; i <= n - 1; i++)
   {
          j = i;
         while ( j > 0 && arr[j-1] > arr[j])
         {
            temp     = arr[j];
            arr[j]   = arr[j-1];
            arr[j-1] = temp;
            j--;
         }
   }
   printf("Sorted list in ascending order:\n");
   for (i = 0; i <= n - 1; i++)
   {
      printf(" %d ", arr[i]);
   }
   return 0;
}
```

Output:-

```
Enter number of elements
7
Enter the 7 integers

  90 57 45 50 7 15 12

Sorted list in ascending order:
7 12 15 45 50 57 90
```

2. Write a program for the Selection sort algorithm?

```
/* C program for Selection Sort */


#include <stdio.h>

void main()

{

  int array[100], n, a, b, pos, temp;

  printf("Enter number of elements\n");
  scanf("%d", &n);
  printf("Enter %d integers\n", n);
  for (a = 0; a < n; a++)
      scanf("%d", &array[a]);
  for (a = 0; a < (n - 1); a++)
 {
     pos = a;
     for (b = a + 1; b < n; a++)
     {
        if (array[pos] > array[b])
           pos = b;
       }
     if (pos != a)
    {
      temp = array[a];
      array[a] = array[pos];
      array[pos] = temp;
      }
   }
    printf("Sorted array in ascending order:\n");
     for (a = 0; a < n; a++)
        printf("%d\n", array[a])
```

Output:-

```
Enter the number of elements
```

```
7
Enter 7 elements:
35 45 50 7 37 2 17
Sorted array in ascending::
2 7 17 35 37 45 50
```

3. Write a program for Bubble sort algorithm.

```
/* C program for Bubble Sort */

#include <stdio.h>
void main()
{
   int array[100], n, a, b, temp;
   printf("Enter number of elements\n");
      scanf("%d", &n);
    printf("Enter %d integers\n", n);
    for (a = 0; a < n; a++)
         scanf("%d", &array[a]);
    for (a = 0 ; a < n - 1; a++)
    {
       for (b = 0 ; b < n - a - 1; b++)
        {
          if (array[b] > array[b+1])
          {
             temp = array[b];
              array[b] = array[b+1];
              array[b+1] = temp;
            }
         }
      }
       printf("Sorted list in ascending order:\n");
       for (a = 0; a < n; a++)
             printf("%d\n", array[a]);
        }
```

Output:-

```
Enter the number of elements in the array:
7
Enter 7 elements:
45 70 6 9 3 15 7
The sorted order of this bubble sort is:
3 6 7 9 15 45 70
```

4. Write a program for the Merge sort algorithm?

```
/* C program for Merge Sort */

#include <stdio.h>
```

```
#define max 10
int a[11] = { 10, 14, 19, 26, 27, 31, 33, 35, 42, 44, 0 };
int b[10];
void merging(int low, int mid, int high) {
   int l1, l2, i;
   for(l1 = low, l2 = mid + 1, i = low; l1 <= mid && l2 <= high; i++) {
      if(a[l1] <= a[l2])
         b[i] = a[l1++];
      else
         b[i] = a[l2++];
   }
    while(l1 <= mid)
      b[i++] = a[l1++];
    while(l2 <= high)
      b[i++] = a[l2++];
    for(i = low; i <= high; i++)
      a[i] = b[i];
}
void sort(int low, int high) {
   int mid;
   if(low < high) {
      mid = (low + high) / 2;
      sort(low, mid);
      sort(mid+1, high);
      merging(low, mid, high);
   } else {
      return;
   }
}
int main() {
   int i;
     printf("List before sorting\n");

   for(i = 0; i <= max; i++)
      printf("%d ", a[i]);
  sort(0, max);

   printf("\nList after sorting\n");

   for(i = 0; i <= max; i++)
      printf("%d ", a[i]);
}
```

Output:-

```
The array is given as
45 7 25 35 15 40 30
Sorted array is
7 12 25 30 35 40 45
```

5. Write a program for the Heap sort algorithm.?

```
/* C Program to sort an array based on heap sort algorithm*/
#include <stdio.h>
void main()
{
    int heap[10], n, i, j, c, root, temp;

    printf("Enter number of elements:\n");
    scanf("%d", &n);
    printf("Enter %d elements:\n");
    for (i = 0; i < n; i++)
    scanf("%d", &heap[i]);
    for (i = 1; i < n; i++)
    {
        c = i;
        do
        {
            root = (c - 1) / 2;
            if (heap[root] < heap[c])
            {
                temp = heap[root];
                heap[root] = heap[c];
                heap[c] = temp;
            }
            c = root;
        } while (c != 0);
    }

    printf("Heap array:\n");
    for (i = 0; i < n; i++)
    printf("%d\t ", heap[i]);
    for (j = n - 1; j >= 0; j--)
    {
        temp = heap[0];
        heap[0] = heap[j];
        heap[j] = temp;
        root = 0;
        do
        {
            c = 2 * root + 1;
            if ((heap[c] < heap[c + 1]) && c < j-1)
                c++;
            if (heap[root]<heap[c] && c<j)
            {
                temp = heap[root];
                heap[root] = heap[c];
                heap[c] = temp;
            }
            root = c;
        } while (c < j);
    }
```

```
    printf("The sorted array is:\n");
    for (i = 0; i < n; i++)
    printf("\t %d", heap[i]);
}
```

Output:-

```
Enter the number of elments:
7
Enter elements:
50 75 90 7 12 25 70
Heap array:
90 75 70 50 25 12 7
The sorted array is:
7 12 25 50 70 75 90
```