LAB-8

1.A given set of N integer elements using Heap Sort technique and compute its time taken.

Code:-

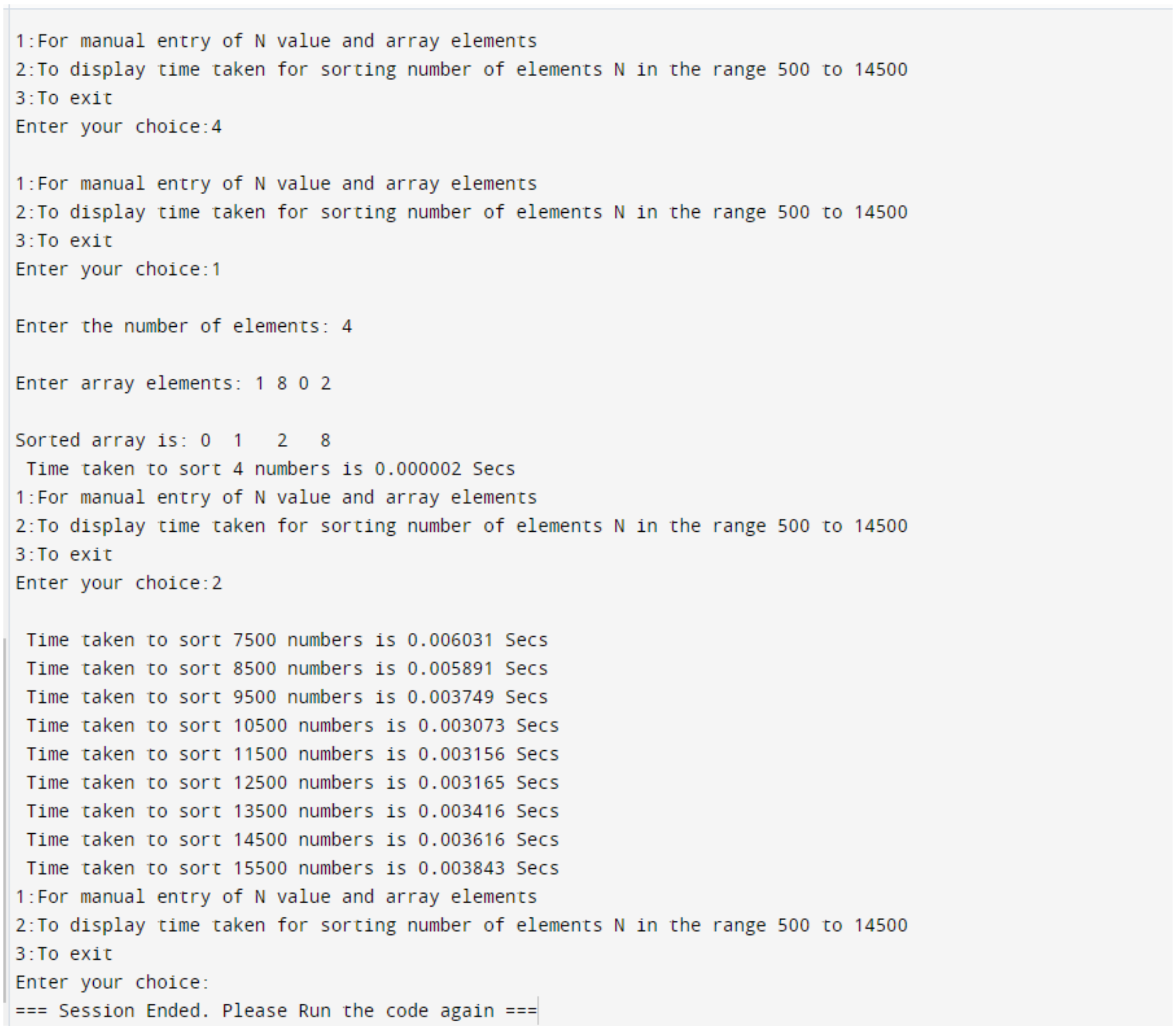
```
#include<stdio.h>

#include<time.h>

#include<stdlib.h>


void swap(int* a, int* b)

{


    int temp = *a;

    *a = *b;

    *b = temp;

}

void heapify(int arr[], int N, int i)

{

    int largest = i;

    int left = 2 * i + 1;

    int right = 2 * i + 2;

    if (left < N && arr[left] > arr[largest])

        largest = left;

    if (right < N && arr[right] > arr[largest])


        largest = right;

    if (largest != i) {


        swap(&arr[i], &arr[largest]);

        heapify(arr, N, largest);

    }
```

```
}
void heapSort(int arr[], int N)
{
    for (int i = N / 2 - 1; i >= 0; i--)


        heapify(arr, N, i);
    for (int i = N - 1; i >= 0; i--) {


        swap(&arr[0], &arr[i]);
        heapify(arr, i, 0);
    }
}



void main(){
   int a[100000],n,i,j,ch,temp;
   clock_t start,end;


   while(1){
    printf("\n1:For manual entry of N value and array elements");
    printf("\n2:To display time taken for sorting number of elements N in the range 500 to 14500");
    printf("\n3:To exit");
    printf("\nEnter your choice:");
    scanf("%d", &ch);
     switch(ch){
       case 1:
           printf("\nEnter the number of elements: ");
           scanf("%d",&n);
           printf("\nEnter array elements: ");
           for(i=0;i<n;i++){
               scanf("%d",&a[i]);
```

```
          }
           start=clock();
           heapSort(a,n);
           end=clock();
           printf("\nSorted array is: ");
           for(i=0;i<n;i++)
              printf("%d\t",a[i]);
           printf("\n Time taken to sort %d numbers is %f Secs",n, (((double)(end-
start))/CLOCKS_PER_SEC));
           break;
       case 2:
      n=7500;
      while(n<=15500) {
           for(i=0;i<n;i++){
              a[i]=n-i;
            }
            start=clock();
            heapSort(a,n);
            for(j=0;j<500000;j++){
                 temp=38/600;
            }
            end=clock();
            printf("\n Time taken to sort %d numbers is %f Secs",n, (((double)(end-
start))/CLOCKS_PER_SEC));
            n=n+1000;
 }
     break;
       case 3:
          exit(0);
    }
    getchar();
    }
```

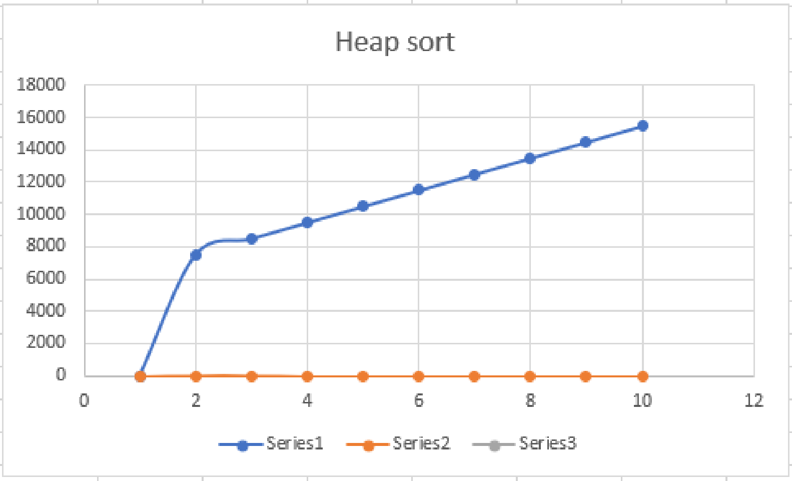
}

Output



```
1:For manual entry of N value and array elements
2:To display time taken for sorting number of elements N in the range 500 to 14500
3:To exit
Enter your choice:4

1:For manual entry of N value and array elements
2:To display time taken for sorting number of elements N in the range 500 to 14500
3:To exit
Enter your choice:1

Enter the number of elements: 4

Enter array elements: 1 8 0 2

Sorted array is: 0  1   2   8
 Time taken to sort 4 numbers is 0.000002 Secs
1:For manual entry of N value and array elements
2:To display time taken for sorting number of elements N in the range 500 to 14500
3:To exit
Enter your choice:2

 Time taken to sort 7500 numbers is 0.006031 Secs
 Time taken to sort 8500 numbers is 0.005891 Secs
 Time taken to sort 9500 numbers is 0.003749 Secs
 Time taken to sort 10500 numbers is 0.003073 Secs
 Time taken to sort 11500 numbers is 0.003156 Secs
 Time taken to sort 12500 numbers is 0.003165 Secs
 Time taken to sort 13500 numbers is 0.003416 Secs
 Time taken to sort 14500 numbers is 0.003616 Secs
 Time taken to sort 15500 numbers is 0.003843 Secs
1:For manual entry of N value and array elements
2:To display time taken for sorting number of elements N in the range 500 to 14500
3:To exit
Enter your choice:
=== Session Ended. Please Run the code again ===
```

N value	Time Taken(secs)
7500	0.006031
8500	0.005891
9500	0.003749
10500	0.003073
11500	0.003156
12500	0.003165
13500	0.003416
14500	0.003616
15500	0.003843

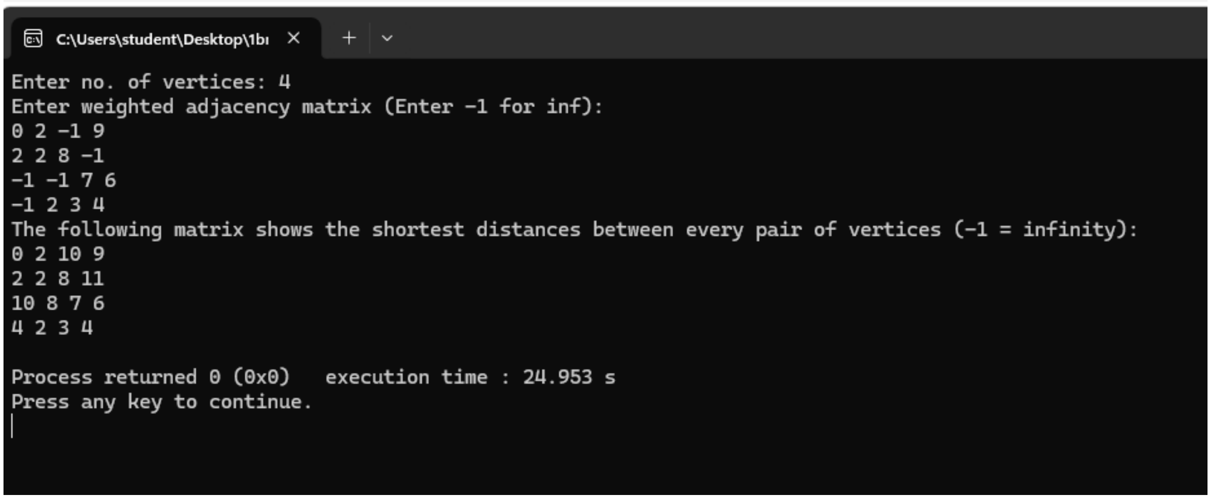


2.Implement All Pair Shortest paths problem using Floyd's algorithm

Code:-

```
#include <stdio.h>
#include <limits.h>
int INF = 1e5;
void printSolution(int v, int dist[v][v]) {
    printf("The following matrix shows the shortest distances between every pair of vertices (-
1 = infinity):\n");
    for (int i = 0; i < v; i++) {
        for (int j = 0; j < v; j++) {
            if (dist[i][j] == INF)
                printf("-1 ");
            else
                printf("%d ", dist[i][j]);
        }
        printf("\n");
    }
}
void floydWarshall(int v, int graph[v][v]) {
    int dist[v][v], i, j, k;
    for (i = 0; i < v; i++)
        for (j = 0; j < v; j++)
            dist[i][j] = graph[i][j];    for (k = 0; k < v; k++) {
               for (i = 0; i < v; i++) {            for (j = 0; j < v; j++)

 {    if (dist[i][k] + dist[k][j] < dist[i][j])
                    dist[i][j] = dist[i][k] + dist[k][j];
            }
        }
    }
    printSolution(v, dist);
}



int main() {
    int v;
    printf("Enter no. of vertices: ");
    scanf("%d", &v);
    int graph[v][v];/* = { {0, 5, INF, 10}, {INF, 0, 3, INF}, {INF, INF, 0, 1}, {INF, INF, INF, 0} }; */
    printf("Enter weighted adjacency matrix (Enter -1 for inf): \n");
    for(int i = 0; i < v; i++){
        for(int j = 0; j < v; j++){
            scanf("%d", &graph[i][j]);
            if (graph[i][j] == -1) graph[i][j] = INF;
        }
    }
    floydWarshall(v, graph);
    return 0;}
```

Output:-


C:\Users\student\Desktop\1bı

```
Enter no. of vertices: 4
Enter weighted adjacency matrix (Enter -1 for inf):
0 2 -1 9
2 2 8 -1
-1 -1 7 6
-1 2 3 4
The following matrix shows the shortest distances between every pair of vertices (-1 = infinity):
0 2 10 9
2 2 8 11
10 8 7 6
4 2 3 4

Process returned 0 (0x0)   execution time : 24.953 s
Press any key to continue.
```