**Bahria University, Lahore Campus**

Department of Computer Science

Lab Journal 08

**(Spring 2023)**

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| Course: | **Data Structures and Algorithm - Lab** | Date: 12-05-2023\_\_\_ |
| Course Code: | CSL-221 | Max Marks: 10 |
| Faculty’s Name: | Fatima Zulfiqar |  |

Name: AFFAN AHMAD \_\_ Enroll No: 03-134221-003\_\_\_ Class: BS(cs)3A\_\_\_\_\_\_\_\_

Objective(s):

Upon completion of this lab session, learners will be able to:

* Implement different problems using recursion
* Implement Merge Sort Algorithm

## Lab Tasks:

**Task 1**

Write a recursive function to find the length of any string. The string should be taken from the user. #include<iostream>

#include<string>

using namespace std;

int lenght(char\* str)

{

if (\*str == '\0')

return 0;

else

return 1 + lenght(str + 1);

}

int main()

{

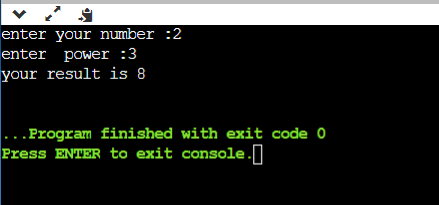
char str[] = "affanahmad";

cout <<"the string is affanahmad"<< endl;

cout << "your string lenght is :"<< lenght(str);

return 0;

}



**Task 2**

Write a recursive function to find the number of occurrence (frequency) of a given character in any string. **Hint:** You can convert all alphabets of input string to lower case for easy computation.

**Sample Output:**

Enter String: Good Morning Pakistan

Enter Character: o

Frequency: o occurred 3 times

**#include<iostream>**

**#include<string>**

**using namespace std;**

**int b=0;**

**void lenght(string str[],string val,int a)**

**{**

**if (str[a]==val)**

**{**

**b++;**

**}**

**if (a==9)**

**{**

**cout << val<< " occurred "<<b<<" times ";**

**}**

**else**

**{**

**lenght(str,val,a+1);**

**}**

**}**

**int main()**

**{**

**int a=0;**

**string str[10] = {"a","f","f","a","n","a","h","m","a","d"};**

**string val;**

**cout <<"enter charactor :";cin>> val;**

**lenght(str,val,a);**

**return 0;**

**}**

**Task 3**

Write a recursive function to compute the power of a given number with a given exponent.

**Sample Output:**

Enter a number: 2

Enter exponent: 3

2^3 = 8

#include<iostream>

#include<string>

using namespace std;

int b=0;

int calculatePower(int val,int p)

{

if (p != 0)

return val \* calculatePower(val, p-1);

else

return 1;

}

int main()

{

int a=1,val,p;

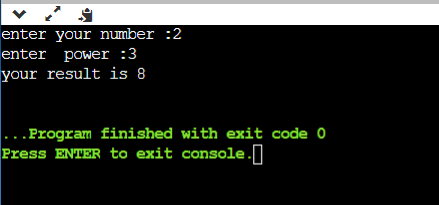
cout <<"enter your number :";cin>> val;

cout << "enter power :";cin>> p;

cout << "your result is " << calculatePower(val,p)<< endl;

return 0;

}



**Task 4**

Write a program that takes your complete name as an input. The program should sort characters in your name in descending order using **Merge Sort Algorithm**. **Hint:** You can convert all alphabets of input string to either upper or lower case for easy computation. Also remove any white spaces.

**Sample Output:**

Enter a string: Fatima Zulfiqar

After Sorting: z u t r q m l i i f f a a a

**Note:** The program should contain main-menu in such a way that all tasks are incorporated in a single program. The user can select either of the options until desires. You can hard code input of Task 4 only.

#include <iostream>

using namespace std;

void merge(string \*,int, int , int );

void merge\_sort(string \*arr, int low, int high)

{

int mid;

if (low < high){

mid=(low+high)/2;

merge\_sort(arr,low,mid);

merge\_sort(arr,mid+1,high);

merge(arr,low,high,mid);

}

}

void merge(string \*arr, int low, int high, int mid)

{

int i, j, k;

string c[50];

i = low;

k = low;

j = mid + 1;

while (i <= mid && j <= high) {

if (arr[i] < arr[j]) {

c[k] = arr[i];

k++;

i++;

}

else {

c[k] = arr[j];

k++;

j++;

}

}

while (i <= mid) {

c[k] = arr[i];

k++;

i++;

}

while (j <= high) {

c[k] = arr[j];

k++;

j++;

}

for (i = low; i < k; i++) {

arr[i] = c[i];

}

}

int main()

{

int num;

string \*myarray=new string[num];

cout<<"Enter number of elements to be sorted:";

cin>>num;

cout<<"Enter "<<num<<" elements to be sorted:";

//for (int i = 0; i < num; i++)

//{

// cin>>myarray[i];

//}

myarray[5]={"a","f","f","a","n"};

merge\_sort(myarray, 0, num-1);

cout<<"Sorted array\n";

for (int i = 0; i < num; i++)

{

cout<<myarray[i]<<"\t";

}

}

**Lab Grading Sheet :**

|  |  |  |  |
| --- | --- | --- | --- |
| **Task** | **Max Marks** | **Obtained Marks** | **Comments(*if any*)** |
| 1. | 2 |  |  |
| 2. | 2 |  |  |
| 3 | 2 |  |  |
| 4 | 4 |  |  |
| **Total** | **10** |  | **Signature** |

**Note : Attempt all tasks and get them checked by your Lab Instructor. Also for each task, attach a screenshot of the output.**