UNIVERSITY OF ENGINEERING AND TECHNOLOGY

(NAROWAL CAMPUS)

Object-Oriented Programming Lab Manual

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Topics: 2-D array using Pointers, Recursive Functions and Structures

Lab Manual

(Object-Oriented Programming Lab)

- **Task 1:**

Create a 2-Dimensional array using pointers in a C++ program

Program:

```
#include <iostream>
using namespace std;
int main(){
    int rows, columns;
    cout<<"Enter the rows length: ";
    cin>>rows;
    cout<<"Enter the columns length: ";
    cin>>columns;
    int **matrix = new int*[rows];
    for(int i=0;i<rows;i++){
        matrix[i] = new int[columns];
    }
    cout<<" --: Enter Matrix Elements :-- "<<endl;
    for(int i=0;i<rows;i++){
        for(int j=0;j<columns;j++){
            cout<<"Enter the element at ("<<i+1<<","<<j+1<<") : ";
            cin>>matrix[i][j];
        }
    }
    cout<< " --: The Array Elements :--"<<endl;
    for(int i=0;i<rows;i++){
        for(int j=0;j<columns;j++){
            cout<<matrix[i][j]<<" ";
        }
        cout<<endl;
    }
    for(int i =0; i<rows;i++){
        delete[] matrix[i];
    }
    delete[] matrix;
    return 0;
}
```

Output:

```
Enter the rows length: 2
Enter the columns length: 3
 --: Enter Matrix Elements :--
Enter the element at (1,1) : 12
Enter the element at (1,2) : 13
Enter the element at (1,3) : 14
Enter the element at (2,1) : 22
Enter the element at (2,2) : 23
Enter the element at (2,3) : 24
 --: The Array Elements :--
12 13 14
22 23 24

D:\UET Narowal\2nd Semester\Object Oriented Programming\Lab\OOP Lab\x64\Debug\OOP Lab.exe (process 11708) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

- **Task 2:**

Create a function that reverses array elements using a recursive approach in a C++ program

Program:

```cpp
#include <iostream>
using namespace std;
void reverseArray(int [], int,int);
int main(){
    int size = 5;
    int arr[5] = {1,2,3,4,5};
    for(int i=0; i<size;i++){
        cout << arr[i] << "\t";
    }
    cout<<endl;
    reverseArray(arr, 0, size-1);
    for(int i=0; i<size;i++){
        cout << arr[i] << "\t";
    }
    return 0;
}
void reverseArray(int array[], int start, int end){
    if(start >= end){
        return;
    }
    int temp = array[start];
    array[start] = array[end];
    array[end] = temp;
    reverseArray(array, start+1, end-1);
}
```

Output:

```
1       2       3       4       5
5       4       3       2       1
D:\UET Narowal\2nd Semester\Object Oriented Programming\Lab\OOP Lab\x64\Debug\OOP Lab.exe (process 16336) exited with code 0.
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```

- **Task 3:**

  Create and initialize a structure in a C++ program

  Program:

```cpp
#include <iostream>
using namespace std;
struct Student {
    string name;
    int age;
};
int main() {
    Student Abdullah;
    Abdullah.name = "Muhammad Abdullah";
    Abdullah.age = 19;
    cout << "Name: " << Abdullah.name << endl;
    cout << "Age: " << Abdullah.age << endl;
    return 0;
}
```

  Output:

```
Name: Muhammad Abdullah
Age: 19

D:\UET Narowal\2nd Semester\Object Oriented Programming\Lab\OOP Lab\x64\Debug\OOP Lab.exe (process 13324) exited with code 0.
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```
