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| **Assignment # 10**  ***Session*: Spring 2022 *Total marks*: 100**  ***Name*** : ***\_\_NIMRA MAQBOOL\_ Roll number* : \_BSCE21012\_** |

***Submission:***

• *Email instructor or TA if there are any questions. You cannot look at others’ solutions or use others’ solutions, however, you can discuss it with each other. Plagiarism will be dealt with according to the course policy.*

*• Submission after due time will not be accepted.*

**There should be a Report explaining your code and highlighting results. Follow this naming convention for your report RollNumber\_Assignment#.pdf e.g BSCE21001\_Assignment9.pdf.**

**Note:** From this assignment onwards, you will create default and parameterized constructor/s and destructor for every class.

**TASK 1:**

Create a class Person. Attributes of Person will include cnic number, name, address, phone number etc.

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| **Function.h:**  #include <iostream> #include <string> using namespace std; class person { protected:  int cnicNumber;  string name;  string address;  int number;  int age;  string gender;  string email;  string qualification; public:  person(){  cnicNumber=0;  name="0";  address="0";  number=0;  age=0;  gender="0";  email="0";  qualification="0";  }  person(int cnic,string Name,string Address,int Num,int Age,string Gender,string Mail,string Qualification){  cnicNumber=cnic;  name=Name;  age=Age;  address=Address;  number=Num;  gender=Gender;  email=Mail;  qualification=Qualification;  }  void display(){  cout<<"NAME :"<<name<<" "<<endl;  cout<<"AGE = "<<age<<" "<<endl;  cout<<"NUMBER = "<<number<<" "<<endl;  cout<<"GENDER = "<<gender<<" "<<endl;  cout<<"MAIL = "<<email<<" "<<endl;  cout<<"QUALIFICATION :"<<qualification<<" "<<endl;  cout<<"ADDRESS = "<<address<<" "<<endl;  cout<<"CNIC NUMBER = "<<cnicNumber<<" "<<endl;  }  ~person(){  cout<<"DESTRUCTOR CALLED.."<<endl;   } };   * **In header file I have made a class of person having protected attributes like name, age, phone number, gender, qualification, email, address, cnic number.** * **Then I have made a default constructor In which I have set the values to zero.** * **Then I have made a display function in which I have displayed all the data members of the array.**   **Main.cpp:**  do{  cout<<"WHICH TASK DO YOU WANT TO PERFORM ?"<<endl;  cout<<"1.TASK 1."<<endl;  cout<<"2.TASK 2."<<endl;  cout<<"3.TASK 3."<<endl;  cout<<"4.EXIT.."<<endl;  cin>>opt;  if(opt==1){  person p;  person P1(123, "Nimra", "98A", 123456, 18, "female", "bsce21012@gmail.com", " student ");  P1.display();  }   * **In main I have a=made an object and then simply called the display function.**   **output:**  **Text  Description automatically generated** |

**TASK 2:**

Create a class Queue as shown below:

class Queue

{

private:

int\* array;

int head; //initialized to zero

int occupied; //initialized to zero

const int max\_length = 10;

public:

void add(int); //adds an element to array at the very next available position

int remove(); //removes an element from first index of array and shift all the elements to the left

bool isEmpty(); //checks if array is empty

bool isFull(); //checks if array is full

};

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| **Function.h:**  class queue { private:  int\* array;  int head;  int occupied; //initialized to zero  const int max\_length = 10;  public:  queue(){  head=0;  occupied=0;  array=NULL;  }  queue(int Head,int Occupied){  head=Head;  occupied=Occupied;  array=new int[10];  }  void add(int element){  int opt;  for(int i=0;i<max\_length;i++){  cout<<"DO YOU WANT TO ADD NUMBER IN ARRAY ?"<<endl;  cout<<"1.YES."<<endl;  cout<<"2.NO."<<endl;  cout<<"3.EXIT.."<<endl;  cin>>opt;  if(opt==1){  cout<<"ENTER ELEMENT = ";  cin>>element;  array[i]=element;  occupied++;  isFull();  }  if(opt==2){  cout<<"YOU CHOOSE NO..."<<endl;  break;  }  if(opt==3){  cout<<"YOU CHOOSE TO EXIT .."<<endl;  exit(5);  }   }  }  int remove() {  int opt;  for(int j=0;j<max\_length-1;++j) {  cout<<"DO YOU WANT TO DELETE NUMBER FROM ARRAY ?"<<endl;  cout<<"1.YES."<<endl;  cout<<"2.NO."<<endl;  cout<<"3.EXIT.."<<endl;  cin>>opt;  if(opt==1){  for (int i = 0; i < max\_length-1; i++) {  array[i] = array[i + 1];  occupied--;  isEmpty();  }  for(int k=0;k<max\_length-1;k++){  cout<<array[k];  }  cout<<endl;  }  if(opt==2){  cout<<"YOU CHOOSE NO.."<<endl;  break;  }  if(opt==3){  cout<<"YOU CHOOSE TO EXIT .."<<endl;  }  }  cout<<"ARRAY IS EMPTY NOW "<<endl;  return occupied;  }  void display(){  for(int i=0;i<max\_length;i++){  cout<<array[i]<<" ";  }  cout<<endl;  }  bool isEmpty(){  if(occupied>0){  return true;  }  else{  return false;  }  }  bool isFull(){  if(occupied==max\_length){  cout<<"THE ARRAY IS FULLY OCCUPIED.."<<endl;  return true;  }  else{  cout<<"NOT FILLED"<<endl;  return false;  }  }  ~queue(){  cout<<"DESTRUCTOR CALLED.."<<endl;  delete []array;  } };   * **In this class I have made an add function in which I have asked the user before entering any number that whether he wants to enter or not, if yes then I add an element to the array and then ask check that array is full or not (I have called the full function in it, in which I have checked that occupation is equal to 10 or not ,is equal then return true else false) and then this loop runs 10 times.** * **Then I have made a remove function in which again I have asked the user if he want to remove or not, if yes then take remove element at zero index and this loop runs 10 times and check that array is empty or not (if occupation is equal to 0 then it is empty and return true else false).**   **Main.cpp:**  if(opt==2){  queue Q;  int element;  queue Q1(0, 0);  Q1.add(element);  Q1.display();  Q1.remove(); }   * **In main, I have just made object and called the function.**   **output:**  **Text  Description automatically generated**  **Text  Description automatically generated**  **Text  Description automatically generated** |

**TASK 3:**

Convert the code of Task 2 to Templates in such a way that we can add/remove a Person in a Queue. Write a driver code to test its output and report your results.

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| **Function.h:**  #include <iostream> #include <string> using namespace std; template <typename T> class queuePerson{ private:  T \*cnic;  int occupied; //initialized to zero  const int max\_length = 10;  public:  queuePerson(){  occupied=0;  cnic=NULL;  }  queuePerson<T>(int Occupied){  occupied=Occupied;  cnic=new T[10];  }  void add(int element){  int opt;  for(int i=0;i<max\_length;i++){  cout<<"DO YOU WANT TO ADD PERSON IN QUEUE ?"<<endl;  cout<<"1.YES."<<endl;  cout<<"2.NO."<<endl;  cout<<"3.EXIT.."<<endl;  cin>>opt;  if(opt==1){  cout<<"ENTER CNIC OF PERSON = ";  cin>>element;  cnic[i]=element;  occupied++;  isFull();  }  if(opt==2){  cout<<"YOU CHOOSE NO..."<<endl;  break;  }  if(opt==3){  cout<<"YOU CHOOSE TO EXIT .."<<endl;  exit(5);  }   }  }  int remove() {  int opt;  int index;  for(int j=0;j<max\_length-1;++j) {  cout<<"DO YOU WANT TO DELETE PERSON FROM ARRAY ?"<<endl;  cout<<"1.YES."<<endl;  cout<<"2.NO."<<endl;  cout<<"3.EXIT.."<<endl;  cin>>opt;  if(opt==1){  int n=max\_length;  n=n-1;  int index;  cout<<"ENTER INDEX = ";  cin>>index;  if(index<n && index>=0) {   for (int i = index; i < n - 1; ++i) {  cnic[i] = cnic[i + 1];  }  }  for(int i=0;i<n;i++){  cout<<cnic[i]<<" ";  }  cout<<endl;   }  if(opt==2){  cout<<"YOU CHOOSE NO.."<<endl;  break;  }  if(opt==3){  cout<<"YOU CHOOSE TO EXIT .."<<endl;  }  }  cout<<"ARRAY IS EMPTY NOW "<<endl;  return occupied;  }  void display(){  for(int i=0;i<max\_length;i++){  cout<<cnic[i]<<" ";  }  cout<<endl;  }  bool isEmpty(){  if(occupied>0){  return true;  }  else{  return false;  }  }  bool isFull(){  if(occupied==max\_length){  cout<<"THE ARRAY IS FULLY OCCUPIED.."<<endl;  return true;  }  else{  cout<<"NOT FILLED"<<endl;  return false;  }  }  ~queuePerson(){  cout<<"DESTRUCTOR CALLED.."<<endl;  delete []cnic;  } };   * **In this class I have just used the templates and ask the user to enter cnic number in case of add function** * **And in remove I have ask him to enter index, and all the class is almost same as above.**   **Main.cpp:**  #include <iostream> #include "Functions.h" #include <string> #include "QueuePerson.h" using namespace std;  int main() {  int opt;  do{  cout<<"WHICH TASK DO YOU WANT TO PERFORM ?"<<endl;  cout<<"1.TASK 1."<<endl;  cout<<"2.TASK 2."<<endl;  cout<<"3.TASK 3."<<endl;  cout<<"4.EXIT.."<<endl;  cin>>opt;  if(opt==1){  person p;  person P1(123, "Nimra", "98A", 123456, 18, "female", "bsce21012@gmail.com", " student ");  P1.display();  }  if(opt==2){  queue Q;  int element;  queue Q1(0, 0);  Q1.add(element);  Q1.display();  Q1.remove();  }  if(opt==3){  int element;  queuePerson<int> q;  queuePerson<int> Q(0);  Q.add(element);  Q.display();  Q.remove();  }  if(opt==4){  cout<<"YOU CHOOSE TO EXIT.."<<endl;  exit(3);  }  }while(opt>=1 && opt<=4);  return 0; }   * **In main I have just made object and in constructor I have enter <T> too then I have called the functions, that’s it.**   **Output:**  **Text  Description automatically generated**  **Text  Description automatically generatedText  Description automatically generated** |