

Answer of OOP1 Midterm Exam Fall 2016

Question 1:

It is required to read the values of 300 bytes, representing pixels of an image segment (each pixel has a value from 0 to 15) and to pack each 2 pixels into one byte of an array of 150 characters. The program then prints the packed array elements in hexadecimal format and determine if the number of bits having value 1 in each element is even or odd.

Answer: Code:

```
#include<iostream>
#include<time.h>
#include<iomanip> //to set width
using namespace std;

void main()
{
    unsigned char pixel1[300], pixel2[150];
    srand(time(NULL));

    for (int i = 0; i < 300; i++)
        pixel1[i]=rand() % 16; //to generate random numbers from 0 to 15
    // note that pixels should be entered by the user

    cout<<"elements of the array of 300 pixels: "<<endl;
    for (int i = 0; i < 300; i++)
        cout<<setw(4)<<hex<<(int)pixel1[i];

    for (int i = 0,j=0; j < 150; i+=2,j++)
    {
        pixel1[i]<<=4;
        pixel2[j]=pixel1[i]|pixel1[i+1];
    }
    cout<<endl<<endl;

    cout<<"elements of the array of 150 pixels after packing each 2 pixels: "<<endl;
    for (int i = 0; i < 150; i++)
        cout<<setw(5)<<hex<<(int)pixel2[i];
    cout<<endl<<endl;

    unsigned char cast,y;
    cast=0x1;

    for (int i = 0; i < 150; i++)
    {
        int count =0;
        while(pixel2[i]!=0)
        {
            y=pixel2[i]&cast;
            if(y==1)
                count++;

            pixel2[i]>>=1;
        }
        if(count%2==0)
            cout<<"the number of bits having the value 1 in element "<<dec<<i<<"="
            "<<count<<" and it is even"<<endl;
        else
            cout<<"the number of bits having the value 1 in element "<<dec<<i<<"="
            "<<count<<" and it is odd"<<endl;
        }
    system("pause");
}
```

Console: note that the console may differ each time we run the code.

```
E:\Faculty of Computer Science 3\OOP1\Project3\Debug\Project3.exe
elements of the array of 300 pixels:
2 a 8 2 3 1 6 9 a b e 0 a d e b 6 0 e 3 5 1 4 8 3 9 4 9 9 0
c 3 d d f 7 c 2 f f 8 6 0 1 d 2 b 4 8 0 1 3 a 0 1 1 9 d c c
7 0 6 4 7 3 f e e 9 3 4 7 c f f a 7 5 8 d 6 2 b a a d d 3 1
3 f 4 5 1 3 9 4 1 f 0 0 a 0 f 7 1 1 9 6 4 c c d a 8 0 0 7 0 4
c d 2 b 8 7 5 8 a 6 e 3 a d b d 9 e f 0 2 6 f b 0 4 c d 1 f
2 f 9 9 0 7 a e a a 2 2 c 2 5 a f 0 c 9 0 4 e e f b f c 6 8
7 b b 6 4 d 7 c 2 3 8 2 9 0 3 3 8 e e 4 1 0 e 4 5 8 c 4 1 a
d 9 9 1 2 0 4 1 d 1 8 c 6 7 8 8 d f b 1 0 f f b f 9 d b e f
f 7 b 9 f a 1 5 2 d c f 5 3 d 2 6 3 0 d 6 b d 9 e 2 c a 0 f
d 4 f 9 6 0 2 f e f 4 9 a e 0 e 5 a b 7 5 6 2 4 c b 6 e d 0

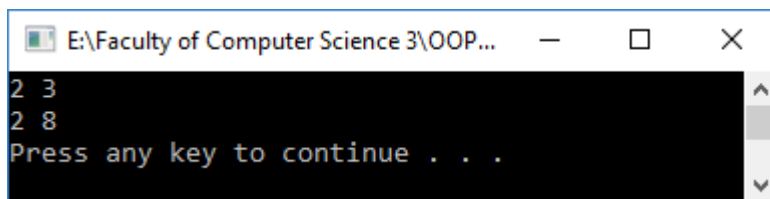
elements of the array of 150 pixels after packing each 2 pixels:
2a 82 31 69 ab e0 ad eb 60 e3 51 48 39 49 90 c3 dd f7 c2 ff 86 1 d2 b4
80 13 a0 11 9d cc 70 64 73 fe e9 34 7c ff a7 58 d6 2b aa dd 31 3f 45 13
94 1f 0 a0 f7 11 96 4c da 80 7 4 cd 2b 87 58 a6 e3 ad bd 9e f0 26 fb
4 cd 1f 2f 99 7 ae aa 22 c2 5a f0 c9 4 ee fb fc 68 7b b6 4d 7c 23 82
90 33 8e e4 10 e4 58 c4 1a d9 91 20 41 d1 8c 67 88 df b1 f fb f9 db ef
f7 b9 fa 15 2d cf 53 d2 63 d 6b d9 e2 ca f d4 f9 60 2f ef 49 ae e 5a
b7 56 24 cb 6e d0

the number of bits having the value 1 in element 0= 3 and it is odd
the number of bits having the value 1 in element 1= 2 and it is even
the number of bits having the value 1 in element 2= 3 and it is odd
the number of bits having the value 1 in element 3= 4 and it is even
the number of bits having the value 1 in element 4= 5 and it is odd
the number of bits having the value 1 in element 5= 3 and it is odd
the number of bits having the value 1 in element 6= 5 and it is odd
the number of bits having the value 1 in element 7= 6 and it is even
the number of bits having the value 1 in element 8= 2 and it is even
the number of bits having the value 1 in element 9= 5 and it is odd
the number of bits having the value 1 in element 10= 3 and it is odd
the number of bits having the value 1 in element 11= 2 and it is even
the number of bits having the value 1 in element 12= 4 and it is even
the number of bits having the value 1 in element 13= 3 and it is odd
the number of bits having the value 1 in element 14= 2 and it is even
the number of bits having the value 1 in element 15= 4 and it is even
the number of bits having the value 1 in element 16= 6 and it is even
the number of bits having the value 1 in element 17= 7 and it is odd
the number of bits having the value 1 in element 18= 3 and it is odd
the number of bits having the value 1 in element 19= 8 and it is even
the number of bits having the value 1 in element 20= 3 and it is odd
the number of bits having the value 1 in element 21= 1 and it is odd
the number of bits having the value 1 in element 22= 4 and it is even
the number of bits having the value 1 in element 23= 4 and it is even
the number of bits having the value 1 in element 24= 1 and it is odd
the number of bits having the value 1 in element 25= 3 and it is odd
the number of bits having the value 1 in element 26= 2 and it is even
the number of bits having the value 1 in element 27= 2 and it is even
the number of bits having the value 1 in element 28= 5 and it is odd
the number of bits having the value 1 in element 29= 4 and it is even
the number of bits having the value 1 in element 30= 3 and it is odd
the number of bits having the value 1 in element 31= 3 and it is odd
the number of bits having the value 1 in element 32= 5 and it is odd
the number of bits having the value 1 in element 33= 7 and it is odd
the number of bits having the value 1 in element 34= 5 and it is odd
the number of bits having the value 1 in element 35= 3 and it is odd
the number of bits having the value 1 in element 36= 5 and it is odd
the number of bits having the value 1 in element 37= 8 and it is even
the number of bits having the value 1 in element 38= 5 and it is odd
the number of bits having the value 1 in element 39= 3 and it is odd
the number of bits having the value 1 in element 40= 5 and it is odd
the number of bits having the value 1 in element 41= 4 and it is even
the number of bits having the value 1 in element 42= 4 and it is even
the number of bits having the value 1 in element 43= 6 and it is even
the number of bits having the value 1 in element 44= 3 and it is odd
the number of bits having the value 1 in element 45= 6 and it is even
the number of bits having the value 1 in element 46= 3 and it is odd
the number of bits having the value 1 in element 47= 3 and it is odd
the number of bits having the value 1 in element 48= 3 and it is odd
the number of bits having the value 1 in element 49= 5 and it is odd
the number of bits having the value 1 in element 50= 0 and it is even
the number of bits having the value 1 in element 51= 2 and it is even
the number of bits having the value 1 in element 52= 7 and it is odd
the number of bits having the value 1 in element 53= 2 and it is even
the number of bits having the value 1 in element 54= 4 and it is even
the number of bits having the value 1 in element 55= 3 and it is odd
the number of bits having the value 1 in element 56= 5 and it is odd
the number of bits having the value 1 in element 57= 1 and it is odd
the number of bits having the value 1 in element 58= 3 and it is odd
the number of bits having the value 1 in element 59= 1 and it is odd
the number of bits having the value 1 in element 60= 5 and it is odd
```

Question 2: What value gets printed by the following C++ program

```
void Myst(int a, int &b){
    a*=b;
    b=2+a;
}
void main(){
    int u=2;
    int v=3;
    cout<<u<<" "<<v<<endl;
    Myst(u,v);
    cout<<u<<" "<<v<<endl;
}
```

Answer:

A screenshot of a Windows command prompt window titled "E:\Faculty of Computer Science 3\OOP...". The window has a black background with white text. The output of the program is displayed as follows:
2 3
2 8
Press any key to continue . . .
The window includes standard Windows window controls (minimize, maximize, close) in the title bar.

Question 3:

a) Construct the following classes:

Employee with following member elements:

ID	(of type int)
Name	(of type char)
Phone	(of type char)
Salary	(of type float)

- b) Write stack class whose elements are objects of type **Employee** and write the push and pop functions only.
- c) Write the main function that use the implemented stack to take the data for a number of **Employees** and insert them into an object of this sack.
- d) Show how the stack can be used to print the inserted **Employees in the order** the user inputs them.

Answer:

```
#include<iostream>
#include<string>
using namespace std;

struct Employee
{
    int id;
    char name[40];
    char phone [50];
    float salary;
};
struct stack
{
    Employee s[10]; //but we will enter 3 employees only
    int top;
};
//we should use the push and pop functions only
void push (stack *stk,Employee e)
{
    stk->top++;
    stk->s[stk->top]=e;
}
Employee pop (stack *stk)
{
    return(stk->s[stk->top--]);
}
void main()
{
    stack s1;
    cout<<"Enter data of 3 employees: "<<endl;
    for (int i = 1; i <= 3; i++)
    {
        Employee e;
        cout<<"Employee "<<i<<": "<<endl;
        cout<<"Enter id: ";
        cin>>e.id;
        cout<<"Enter Name: ";
        cin>>e.name;
        cout<<"Enter phone: ";
        cin>>e.phone;
        cout<<"Enter Salary: ";
        cin>>e.salary;
        cout<<endl;

        push(&s1,e);
    }
    //to print the inserted Employees in the order the user inputs them
    stack s2;
    for (int i = 0; i < 3; i++)
        push(&s2,pop(&s1));

    cout<<"----- printing data -----"<<endl;
    for (int i = 1; i <= 3; i++)
    {
        Employee k;
        k=pop(&s2);
        cout<<"--- Employee "<<i<<" ---"<<endl;
        cout<<"Id: "<<k.id<<endl;
        cout<<"Name: "<<k.name<<endl;
        cout<<"Phone: "<<k.phone<<endl;
        cout<<"Salary: "<<k.salary<<endl<<endl;
    }
}
```

a)

b)

c)

d)

E:\Faculty of Computer Science 3\OOP1\Project15\Debug\Project15.exe

Enter data of 3 employees:

Employee 1:

Enter id: 38964

Enter Name: Antonio

Enter phone: 25698745

Enter Salary: 5000

Employee 2:

Enter id: 15698

Enter Name: Mina

Enter phone: 34256985

Enter Salary: 7000

Employee 3:

Enter id: 29654

Enter Name: Fady

Enter phone: 25465613

Enter Salary: 3000

----- printing data -----

--- Employee 1 ---

Id: 38964

Name: Antonio

Phone: 25698745

Salary: 5000

--- Employee 2 ---

Id: 15698

Name: Mina

Phone: 34256985

Salary: 7000

--- Employee 3 ---

Id: 29654

Name: Fady

Phone: 25465613

Salary: 3000

Press any key to continue . . .