Final Flashback

Assignment:
This assignment uses the past labs you have created. You have the option of either combining past labs into one larger lab, or using them individually to solve the listed problems.

1. Decrypt the following: “Lo cebo dy nbsxu iyeb Yfkvdsxo”
2. Convert 871 to base 7.
3. Feed the following to your Hamming Receiver: 1101011. Correct any errors, and print out the message that was transmitted.
4. Universal Set: [1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20]
   Set A: [1,2,3,5,8,13]
   Set B: [1,3,5,7,9,11,13,15,17,19]
   Set C: [1,2,3,5,7,11,13,17,19]
   Please print out: ((A Union B) Intersect C)
5. 5.) Present a Truth Table for the following statement: !(A XOR C) NAND (B OR A)

(100 pts total: 10 points for each code, 10 points for each screenshot.)

Code:

```
// Name: Dawlat Hamad
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// Lab 12 - Final Flashback
// Copy and past of my other labs wit some adjustments.

#include <iostream>
#include <string>
#include <cstdio>
#include <algorithm>
#include <vector>
using namespace std;

//For Lab 9 Question 3)
int concat(int a, int b, int c, int d)
{
   string s1 = to_string(a);
   string s2 = to_string(b);
   string s3 = to_string(c);
   string s4 = to_string(d);
   string s = s1 + s2 + s3 + s4;
   int m = stoi(s);
   return m;
}

//For Lab 9 Question 3)
int Bin2Dec(int num)
{
   int dec = 0;
```

```
    int base = 1;
    int rem;
    int temp = num;

    //Convert loop
    while (temp)
    {
        rem = temp % 10;
        temp = temp / 10;
        dec += rem * base;
        base = base * 2;
    }

    return dec;
}

int main()
{
    //Lab 7 - Brute Force (Question 1)
    int key;
    string cipher;
    string ch;
    cout << endl;
    cout << "---Question 1---" << endl;
    cout << "Enter cipher to decode: ";
    getline(cin, cipher);
    for(key = 1; key <= 26; key++)
    {
        ch = "";
        cout << key << ") ";
        for(int i = 0; i < cipher.size(); i++)
        {
            if(isupper(cipher[i]))
            {
                ch += char (int (cipher[i] + key - 'A') % 26 + 'A');
            }
            else if(islower(cipher[i]))
            {
                ch += char (int (cipher[i] + key - 'a') % 26 + 'a');
            }
            else
            {
                ch += cipher[i];
            }
        }
        cout << ch << endl;
```

```
}

//Lab 4 - Base Converter (Question 2)
int number;
int base;
int x;
string letter;
string answer;
cout << endl;
cout << "--Question 2---" << endl;
cout << "Decimal Number: ";
cin >> number;
cout << "Base: ";
cin >> base;
while (number != 0)
{
   x = number % base;
   if (x < 10)
   {
      letter = '0' + x;
   }
   else
   {
      letter = x - 10 + 'A';
   }
   answer = letter + answer;
   number /= base;
}
cout << "Answer: " << answer << endl;

//Lab 9 - Hamming Code (Question 3)
int c[10];
int p1;
int p2;
int p4;
int totalp;
cout << endl;
cout << "--Question 3---" << endl;
cout << "Enter the 7-bit code: ";
for (int i = 1; i < 8; i++)
{
   cin >> c[i];
}
p1 = c[1] ^ c[3] ^ c[5] ^ c[7];
p2 = c[2] ^ c[3] ^ c[6] ^ c[7];
p4 = c[4] ^ c[5] ^ c[6] ^ c[7];
```

```
totalp = p1*1 + p2*2 + p4*4;
if (totalp == 0)
{
   cout << "No errors found." << endl;
}
else
{
   cout << "Error found in bit: " << totalp << endl;
   cout << "Correct code is:";
   if (c[totalp] == 0)
   {
      c[totalp] = 1;
   }
   else
   {
      c[totalp] = 0;
   }
   for (int i = 1; i < 8; i++)
   {
      cout << " " << c[i];
   }
   cout << endl;
}
cout << "The Binary Number recieved is: ";
cout << c[3] << c[5] << c[6] << c[7] << endl;
cout << "The Decimal Number is: ";
cout << Bin2Dec(concat(c[3], c[5], c[6], c[7])) << endl;

//Lab 8 - Set Theory (Question 4)
int U[ ] = {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20};
int A[ ] = {1,2,3,5,8,13};
int B[ ] = {1,3,5,7,9,11,13,15,17,19};
int C[ ] = {1,2,3,5,7,11,13,17,19};
vector<int> v1(20);
vector<int>::iterator it1;
vector<int> v2(20);
vector<int>::iterator it2;
sort (U, U+20);
sort (A, A+6);
sort (B, B+10);
sort (C, C+9);
cout << endl;
cout << "---Question 4---" << endl;
cout << "Set U: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20" << endl;
cout << "Set A: 1 2 3 5 8 13" << endl;
cout << "Set B: 1 3 5 7 9 11 13 15 17 19" << endl;
```

```
    cout << "Set C: 1 2 3 5 7 11 13 17 19" << endl;
    cout << "(A union B) intersect C:";
    it1 = set_union (A, A+6, B, B+10, v1.begin());
    v1.resize(it1 - v1.begin());
    it2 = set_intersection (v1.begin(), v1.end(), C, C+9, v2.begin());
    v2.resize(it2 - v2.begin());
    for (it2 = v2.begin(); it2 != v2.end(); ++it2)
    {
        if(*it2 == 0)
        {
            cout << " EMPTY SET";
        }
        else
        {
            cout << ' ' << *it2;
        }
    }
    cout << endl;

    //Lab 2 - Truth Table (Question 5)
    int lista[8] = {0, 0, 0, 0, 1, 1, 1, 1};
    int listb[8] = {0, 0, 1, 1, 0, 0, 1, 1};
    int listc[8] = {0, 1, 0, 1, 0, 1, 0, 1};
    cout << endl;
    cout << "---Question 5---" << endl;
    cout << "!(A XOR C) NAND (B OR A)\t" << endl;
    cout << "A\tB\tC\tT" << endl;
    for (int i = 0; i < 8; i++)
    {
        cout << lista[i] << "\t" << listb[i] << "\t" << listc[i] << "\t";
        cout << (!((!(lista[i] ^ listc[i])) & (listb[i] | lista[i]))) << "\t";
        cout << endl;
    }

    cout << endl;
    return 0;
}
```

Output:

```
---Question 1---
Enter cipher to decode: Lo cebo dy nbsxu iyeb Yfkvdsxo
1) Mp dfcp ez octyv jzfc Zglwetyp
2) Nq egdq fa pduzw kagd Ahmxfuzq
3) Or fher gb qevax lbhe Binygvar
4) Ps gifs hc rfwby mcif Cjozhwbs
5) Qt hjgt id sgxcz ndjg Dkpaixct
6) Ru ikhu je thyda oekh Elqbjydu
7) Sv jliv kf uizeb pfli Fmrckzev
8) Tw kmjw lg vjafc qgmj Gnsdlafw
9) Ux lnkx mh wkbgd rhnk Hotembgx
10) Vy moly ni xlche siol Ipufnchy
11) Wz npmz oj ymdif tjpm Jqvgodiz
12) Xa oqna pk znejg ukqn Krwhpeja
13) Yb prob ql aofkh vlro Lsxiqfkb
14) Zc qspc rm bpgli wmsp Mtyjrglc
15) Ad rtqd sn cqhmj xntq Nuzkshmd
16) Be sure to drink your Ovaltine
17) Cf tvsf up esjol zpvs Pwbmujof
18) Dg uwtg vq ftkpm aqwt Qxcnvkpg
19) Eh vxuh wr gulqn brxu Rydowlqh
20) Fi wyvi xs hvmro csyv Szepxmri
21) Gj xzwj yt iwnsp dtzw Tafqynsj
22) Hk yaxk zu jxotq euax Ubgrzotk
23) Il zbyl av kypur fvby Vchsapul
24) Jm aczm bw lzqvs gwcz Wditbqvm
25) Kn bdan cx marwt hxda Xejucrwn
26) Lo cebo dy nbsxu iyeb Yfkvdsxo

--Question 2---
Decimal Number: 871
Base: 7
Answer: 2353

--Question 3---
Enter the 7-bit code: 1 1 0 1 0 1 1
Error found in bit: 6
Correct code is: 1 1 0 1 0 0 1
The Binary Number recieved is: 0001
The Decimal Number is: 1

---Question 4---
Set U: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Set A: 1 2 3 5 8 13
Set B: 1 3 5 7 9 11 13 15 17 19
Set C: 1 2 3 5 7 11 13 17 19
(A union B) intersect C: 1 2 3 5 7 11 13 17 19

---Question 5---
!(A XOR C) NAND (B OR A)
A       B       C       T
0       0       0       1
0       0       1       1
0       1       0       0
0       1       1       1
1       0       0       1
1       0       1       0
1       1       0       1
1       1       1       0
```