

ECE 2305 – Introduction to C Programming

Programming Project 06 Hexadecimal and Decimal Numbers

Write a C++ Console Application that will convert a user input decimal (base 10) integer number in the range 0 to 65535 to hexadecimal (base 16) and a 4 digit hexadecimal number to decimal. The hexadecimal number shall be a 4 character **string** type data.

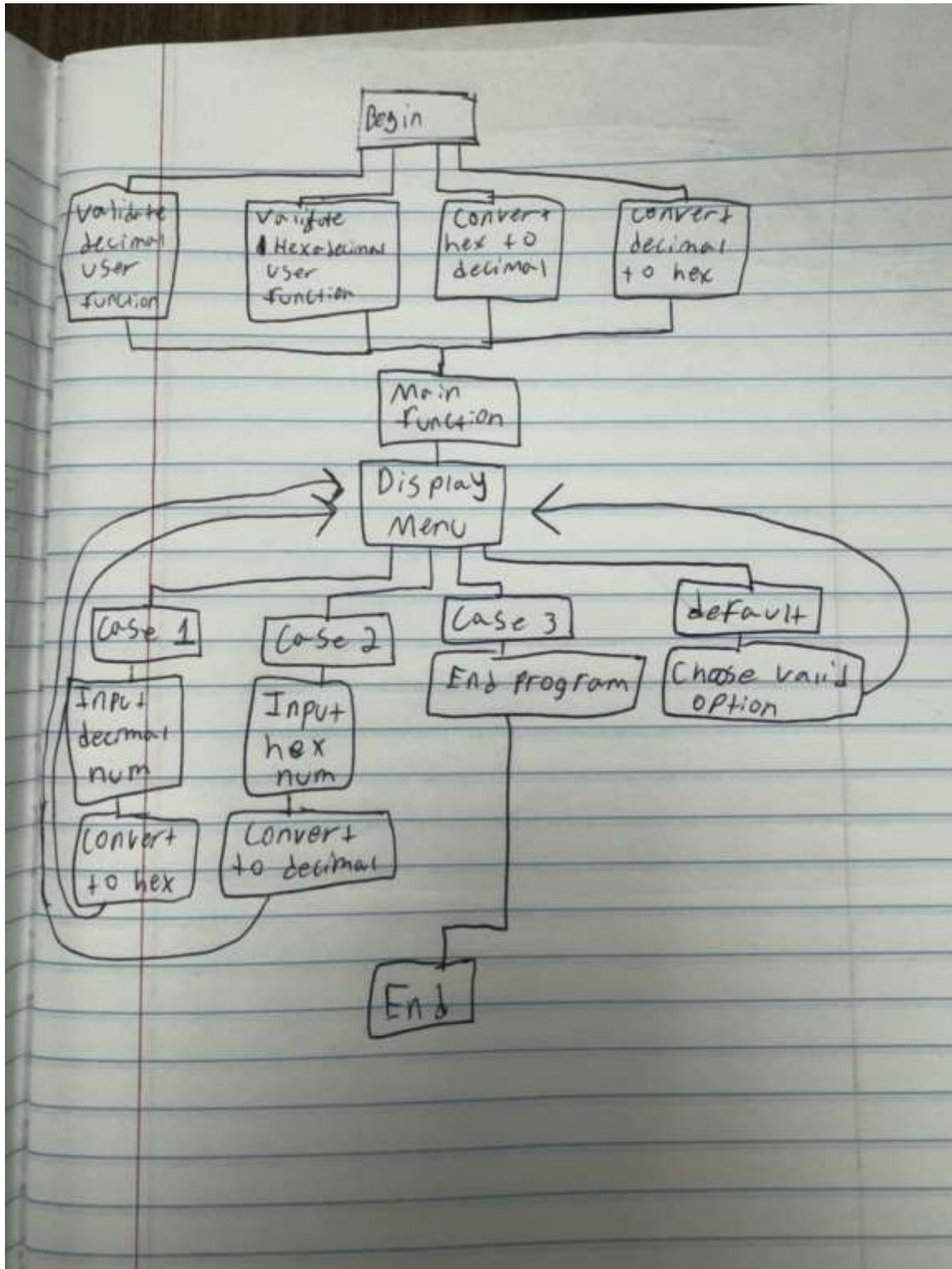
Write structured programs that use separate functions for each operation.

Document the programs with:

A. A written description of the program describing the purpose of the program and the structure of the program.

The purpose of this program is to convert decimal numbers to hexadecimal and vice versa. It uses 4 user defined functions followed by the main function that uses a do while loop and switch case structure.

B. A flowchart that illustrates the structure of the program.



C. The code listing.

```
1 //ECE 2305 Programming Project 6-Kaleb Badgett
2
3 #include<iostream>
4 #include <string>
5 #include <cmath>
6 using namespace std;
7
8 bool valid_dec(int n)
9 {
10     if (0 <= n && n <= 65535) return 1;
11     else return 0; //Check for valid decimal number
12 }
13
14 bool valid_hex(string s)
15 {
16     bool v = 1;
17     int length = s.length(); //Set length equal to length of array
18
19     if (length == 4)
20     {
21         for (int n = 0; n < length; n++)
22         {
23             if ((s[n] >= 48 && s[n] <= 57) || (s[n] >= 65 && s[n] <= 70))//Comparing hex number to ASCII code
24             {
25                 v = 1;
26             }
27             else
28             {
29                 v = 0;
30             }
31         }
32     }
33     else v = 0;
34     return v; //Check for valid hexadecimal number
35 }
36
```

```

37 string dec_to_hex(int Q)
38 {
39     int r = 0;
40     string h = "0000";
41
42     for (int n = 3; n >= 0; n--)
43     {
44         r = Q % 16;
45         Q = Q / 16; //Find quotient and remainder to convert to hexadecimal
46
47         if (r <= 9)
48         {
49             h[n] = r + 48;
50         }
51         else
52         {
53             h[n] = r + 55;
54         } //Set hex number by ASCII code
55     }
56     return h;
57 }
58
59 int hex_to_dec(string s)
60 {
61     int d = 0;
62
63     for (int n = 0; n < 4; n++)
64     {
65         if (s[3 - n] > 57) //Find what ASCII code range the hex digit is in
66         {
67             d = d + (int(s[3 - n]) - 55) * pow(16, n); //Convert to decimal based on ASCII code
68         }
69         else
70         {
71             d = d + (int(s[3 - n]) - 48) * pow(16, n); //Convert to decimal based on ASCII code
72         }
73     }
74     return d;
75 }
76

```

```

77 int main()
78 {
79     int dec = 0;
80     string hex = "0000";
81     int choice = 0;
82
83     do
84     {
85         system("cls");//Reset system after choice is made
86
87         cout << "Decimal form: " << dec << "\t" << "Hex form: " << hex << endl;
88         cout << endl;
89
90         cout << "Menu" << endl;
91         cout << endl;
92         cout << "1. Enter number in decimal" << endl;
93         cout << "2. Enter number in hexadecimal" << endl;
94         cout << "3. End" << endl;
95         cout << endl;//Menu
96
97         cin >> choice;
98
99         switch(choice)
100        {
101            case 1:
102            {
103                cout << "Give me a number in decimal form" << endl;
104                cin >> dec;
105                cout << endl;
106
107                if (valid_dec(dec))
108                {
109                    hex = dec_to_hex(dec);
110                }
111
112                system("pause");
113                break;
114            }

```

```

115     case 2:
116     {
117         cout << "Give me a number in hexadecimal form" << endl;
118         cin >> hex;
119         cout << endl;
120
121         if (valid_hex(hex))
122         {
123             dec = hex_to_dec(hex);
124         }
125
126         system("pause");
127         break;
128     }
129     case 3:
130     {
131         cout << "Goodbye" << endl;
132
133         system("pause");
134         break;
135     }
136     default:
137     {
138         cout << "Choose a valid option" << endl;
139         system("pause");
140         break;
141     }
142 }
143
144 } while (choice != 3); //Loop until 3 is selected
145

```

D. Screen shots showing the program in operation.

```

C:\Users\kaleb\source\repos\
Decimal form: 0 Hex form: 0000

Menu

1. Enter number in decimal
2. Enter number in hexadecimal
3. End

1
Give me a number in decimal form
54899

Press any key to continue . . .

```

```
C:\Users\kaleb\source\repos\ X + v
Decimal form: 54899      Hex form: D673

Menu

1. Enter number in decimal
2. Enter number in hexadecimal
3. End
```

```
C:\Users\kaleb\source\repos\ X + v
Decimal form: 54899      Hex form: D673

Menu

1. Enter number in decimal
2. Enter number in hexadecimal
3. End

2
Give me a number in hexadecimal form
FF6A

Press any key to continue . . . |
```

```
C:\Users\kaleb\source\repos\ X + v
Decimal form: 65386      Hex form: FF6A

Menu

1. Enter number in decimal
2. Enter number in hexadecimal
3. End
```