Date handed out: **Thursday 5 March 2015**
Date submission due: **Friday 21 March 2015**

Programming Assignment 1: Simple Decoder

Purpose:
The main purpose of this programming assignment is to revise the topics covered in the first three weeks including fundamentals of C programming, conditional statements and repetitive statements. In this assignment, you will also practice using character datatype and also you will be able to work with ASCII code.

Description:
In this assignment you will write a small C program that decodes a text with a given key. It uses a very simple encryption algorithm. Your program will mainly take the code and the text and then decode the text.

Programming Requirements:
Your program will work as follows. Your program will have two options one for decoding the given text and the other one for changing the given code. When the user first runs the program, you will display the following menu:

```
Happy Decoder!
(1) Decode text
(2) Change the secret code
(3) Quit
You choose:
```

Depending on the option given by the user, your program will work as follows:

Option 1: You will have a secret code maintained as a single character. However, we will use the ASCII code of that character as the secret code. Your program needs to start by default with the secret code "A" which is 65 in decimal and 01000001 in binary. When the user chooses this option, your program will first ask which base will you use to enter text as follows.

```
You have chosen option 1!
Which base will you use to enter text (base 10/8/2)? 2
Please enter the text to decode: 000000100000111100000110
```

The text can be entered in different bases. In base 2, base 10 or base 8. If the user is entering the text in base 2, then you will not need to make base conversions. However, if the user is entering in base 10 or base 8, then you will need to convert it to binary for decoding.

Assuming that the user is entering the text in base 2, then your program will then take every 8 digit as the ASCII code of a character and will decode it with the key. If the text is entered in base 8 or 10, your program will take every 3 digits as the ASCII code of a character and will decode it with the key.

```
Which base will you use to enter text (base 10/8/2)? 2
Please enter the text to decode: 000000100000111100000110
```

Your program will then take each character and decode as follows:

DecodedCharacter = OriginalCharacter ⊕ K (key)

Bitwise XOR (exclusive or) is given by the table below:

X(where X is a single bit)	Y (where Y is a single bit)	X XOR Y
1	1	0
1	0	1
0	1	1
0	0	0

Assume that the key is A which is 01000001 that means you will decode each character entered in binary with this key and your output will be as follows:

```
Your Decoded text is: CNG
```

Please note that you cannot use the bitwise and/or/xor operations provided in C.

Option 2: If the user selects option 2, then he/she will change the secret code which is A by default.

```
You have chosen option 2!
Which secret code will you use? C
Binary equivalent of the chosen code is 01000011
```

Full Sample Run:

```
Happy Decoder!
(1) Decode text
(2) Change the secret code
(3) Quit
You choose: 1
You have chosen option 1
Which base will you use to enter text (base 10/8/2)? 2
Please enter the text to decode: 000000100000111100000110
Your Decoded text is: CNG

Happy Decoder!
(1) Decode text
(2) Change the secret code
(3) Quit
You choose: 1
You have chosen option 1
Which base will you use to enter text (base 10/8/2)? 10
Please enter the text to decode: 002015006
Your Decoded text is: CNG

Happy Decoder!
(1) Decode text
(2) Change the secret code
(3) Quit
You choose: 1
You have chosen option 1
Which base will you use to enter text (base 10/8/2)? 8
Please enter the text to decode: 002017006
Your Decoded text is: CNG


Happy Decoder!
(1) Decode text
(2) Change the secret code
(3) Quit
You choose: 2
```

```
You have chosen option 2
Which secret code will you use? C
Binary equivalent of the chosen code is 01000011

Happy Decoder!
(1) Decode text
(2) Change the secret code
(3) Quit
You choose: 3
You have chosen option 3
Bye bye!
```

Grading Schema:
Your program will be graded as follows:

Grading Point	**Mark (100)**
The menu (keeping the users in a loop until exit is chosen)	10
Reading text	10
Error message for inappropriate text	10
Converting to correct base	20
XOR operation	15
Decoding Text	20
Changing the secret code (option 2)	5
Code quality (e.g., appropriate comments, variable names, formulation of selection statements and loops, etc)	10

Rules:
Please make sure that you follow the restrictions for the assignment as follows.

- Strictly obey the input output format. Do not print extra things.
- **You are not allowed to use data structures such as arrays to store values for the conversion operation.**
- **You are not allowed to define your own functions.**
- **You cannot use XOR operation in C.**
- **You are not allowed to use goto statement.**
- **You are not allowed to use global variables.**
- Name your source file "CNG140-P1.c"
- Upload only source file. Do not compress it (zip, rar, …)