

COL100 Lab 5

I semester 2016-17

Week 5, 2016

Objective

To be able to write simple C programs involving loops and conditional statements.

Instructions

1. After 1 hour 45 minutes have passed, your code will be checked. Whatever you have completed till this point will be recorded. Anything that you complete later will not be recorded.
2. If you complete an assignment later, you can ask the TAs of your lab session any problems and doubts that you face. There is no need to show the TA your code, if there is no problem in it.
3. You cannot attend any lab session other than your allotted session, without informing the TAs of the session you are attending. This too is permitted only for genuine reasons.
4. Also, you will not get attendance, if you do not attend your own lab session, nor will your performance be noted. (Even if you fill in the attendance sheet, it will not be uploaded later.)

Programs

- Press Ctrl + Alt + T to open a terminal.
- cd to the directory COL100.
- In this directory, create another folder, called as lab5.
- cd to lab5.

NOTE: Add *printf* statements to see the flow of your code. It will also help you to find out the error, if there is any.

1. Write a program to find 1's and 2's complement of a given 4-bit binary number. Your program should prompt the user to enter a 4-bit binary number and then return 1's and 2's complement of that number. Also, your program should prompt an error message on the terminal if the number is not in binary form.

Example: Binary number: 0010

1's complement of 0010 is - 1101

2's complement of 0010 is - 1110

(Hint: while taking input from the user store individual bit of the binary number in a unique variable)

2. Write a program using loops and conditional statements to determine the numbers between 0 and n which are-
 - (a) Multiples of 2
 - (b) Multiples of 2 but not 5
 - (c) Multiples of 2 or 5 or both

Your program should take the value of n from the user.

3. Write a program to generate the following pattern of '*' with n columns on terminal using loops. Your program should prompt the user to enter the value of n i.e., the number of columns in the pattern.

Example: For $n = 5$

```

                *
              * *
            * * *
          * * * *
        * * * * *
      * * * * *
    * * * * *
  * * * *
 * * *
  * *
   *
```

4. Write a program to check whether a number is a palindrome or not. Note that a number is a palindrome if the reverse of that number is same as the original number. Your program should take a number as an input from the user and prompt a message on terminal saying whether that number is a palindrome or not.

Example 1:

Enter a number: 54345

54345 is a palindrome

Example 2:

Enter a number: 23451

23451 is not a palindrome

Homework Programs

1. Write a program to perform the following bit-wise logical operations on two 4-bit binary numbers. Your program should ask the user to enter two 4-bit numbers, one bit at a time. Also, your program should prompt an error message on the terminal if the numbers are not in binary form. (Hint: while taking input from the user store each bit in a unique variable.) Logical operations: AND, OR, NAND and NOR.
Example:
Number 1 - 1100
Number 2 - 0110
Bit-wise AND - 0100
Bit-wise OR - 1110
Bit-wise NAND - 1011
Bit-wise NOR - 0001
(Your program should not use bit-wise operators.)
2. Write a program using loops and conditional statements to determine if a number entered by the user is divisible by-
 - (a) 4
 - (b) 3(Your program should not use modulus(%) operator.)
3. Write a program to compute the following using loops-
 - (a) Take two numbers as input, a and b . Now without using multiplication operand, compute the product $a * b$.
(Hint: $5 * 3 = 5 + 5 + 5$)
 - (b) Take two numbers as input x and y . Now without using math.pow or power operand, compute x^y .
(Hint $2^4 = 2 * 2 * 2 * 2$).
4. Write a program to determine the greatest power of 2 which is less than or equal to the input value n . Your program should take the value of n from the user.
Examples:
For $n = 5$, return 4 (i.e. $2^2 < 5$)
For $n = 21$, return 16 (i.e. $2^4 < 21$)
For $n = 29$, return 16 (i.e. $2^4 < 29$)
For $n = 100$, return 64 (i.e. $2^6 < 100$)
5. (a) Write a program to print the first n terms of an Arithmetic Progression. Your program should prompt the user to input the first term a , the common difference d , and the count of terms n that need to be printed. Then the program should print the first n numbers of the series.

- (b) Write a program to produce the n^{th} fibonacci number. Fibonacci series looks like this: 1, 1, 2, 3, 5, 8, 13, 21, ... Notice every number in the series is the sum of the previous two numbers.
(Hint: In Arithmetic progressions problem, the new number gets calculated as the sum of the previous number and the common difference. Here also the new number gets calculated as the sum of the previous two numbers, and a difference. But unlike AP, the difference also gets updated.)
- (c) A general formula to generate the fibonacci series is-
 $F(0) = 1, F(1) = 1,$
 $F(n) = F(n-1) + F(n-2)$
 Write a program to observe that the ratio of consecutive Fibonacci numbers converges to a fixed value i.e. $F(n+1)/F(n) = \phi$ where ϕ is the “Golden Ratio”.
 (Hint: Compute $1/1 = 1, 2/1 = 2, 3/2 = 1.5, 5/3 = 1.66667, 8/5 = 1.6, 13/8 = 1.625, 21/13 = 1.61538, \dots$ Stop iterating the loop when the ratio at the k^{th} iteration is equal to (upto five decimal places) the ratio at the $(k + 1)^{\text{th}}$ iteration.)
 Also, compute the value of the equation $(1 + \sqrt[3]{5})/2$ and see if this value is equal to the fixed value ϕ obtained above.

Useful Commands in Linux

1. Open terminal: Ctrl + Alt + T
2. Terminate current Linux command: Ctrl + C
3. Make a new directory: `mkdir dirname`
4. Copy: `cp src dest`
5. Rename: `mv originalname newname`
6. Delete: `rm filename`
7. Change working directory: `cd path`
8. List contents of a folder: `ls`
9. List contents of a folder including hidden files: `ls -a`
10. Print current directory: `pwd`

Points to Remember

1. To set proxy: Open an internet browser and set the Automatic proxy configuration url to `http://www.cc.iitd.ernet.in/cgi-bin/proxy.btech` (or

proxy.dual if you are a Dual Degree student).
(For Firefox, open Options > Advanced > Network Tab > (Connection)
Settings > Choose “Automatic proxy configuration” and set the URL)

Optional : Use vim editor

1. Open a file: vim filename.txt
2. Insert in a file: i (insert mode) (Use Esc to come out of the insert mode)
3. Navigation: arrow keys
4. Undo u
5. Redo Ctrl+R
6. Saving a file :w
7. Closing a file without saving :q!
8. Saving and closing a file :wq
9. Deleting a line dd
10. Copying a line yy
11. Pasting a line p