

Lab and Home Assignments

Programming for Problem Solving Lab (CSEN 1051)

Session: 2021 – 2022

Week 1:

Lab Assignments: LINUX commands and LINUX based editor

Learning to use basic LINUX commands: pwd, ls, mkdir, cd, cat, clear, cp, mv, rm, chmod and more. Learning to use LINUX based editor(s): vi and gedit

Home Assignment:

Use the LINUX commands taught during the first lab assignment and show how those commands work. You can either write or print the contents of the terminal after using all the commands.

Week 2: Basic Problem Solving

Lab Assignments:

1. Write a program to calculate the average of two numbers.
2. Write a program to assign the number 34.5678 to a variable named number. First display number rounded to the nearest integer value and then display number rounded to two decimal places
3. The method of computing the yearly depreciation of the value of an item is given by the following equation:

$$\text{Depreciation} = \frac{\text{Purchase Price} - \text{Salvage Value}}{\text{Years of Service}}$$

Write a program to determine the salvage value of an item when the purchase price, years of service and the annual depreciation are given by the user.

Week 3: Basic Problem Solving

Lab Assignments:

1. Write a program to input temperature in Celsius scale and convert it to Fahrenheit. Display the result.
2. Write a program which accepts retail price of a good and calculates the price to be displayed on the product and a discounted price for the customer. The seller wants to keep 15% profit over the retail price and wants that a 5% discount is given to the customer. Then calculate and print the price that will be displayed on the product as well as the discounted price that the customer has to pay.

Week4: Control Statements

Lab Assignments:

1. Write a program to input a student's score in a subject (out of hundred) and print a grade as output as per the following rules:
 - i. Marks ≥ 90 ----- O
 - ii. $89 \geq \text{Marks} \geq 80$ ----- E
 - iii. $79 \geq \text{Marks} \geq 70$ ----- A
 - iv. $69 \geq \text{Marks} \geq 60$ ----- B
 - v. $59 \geq \text{Marks} \geq 50$ ----- C
 - vi. $49 \geq \text{Marks} \geq 40$ ----- D
 - vii. $40 > \text{Marks}$ ----- F
2. Write a program to find the roots (real and imaginary) of the quadratic equation of the form $ax^2 + bx + c = 0$.
3. Develop a simple calculator to accept two floating point numbers from the key-board. Then display a menu to the user and let him/her select a mathematical operation to be performed on those two numbers. Then display the answer. A sample run of your program should be similar to the following:
Enter number 1: 20
Enter number 2: 12
Mathematical Operations:
1 – Add
2 - Subtract
3 - Multiply
4 - Divide
Enter your preference: 2
Answer: 8.00

Home Assignments

1. Consider a currency system in which there are notes of seven denominations, namely, Re.1, Rs. 2, Rs.5, Rs.10, Rs. 50 and Rs. 100. If a sum of Rs. N is entered through the keyboard, write a program to compute the smallest number of notes that will combine to give Rs. N.

Week 5: Loops

Lab Assignments:

1. Write a program to evaluate the summation of the following series, where the number of terms N and independent variable X are taken as input from the user:
 $1 - X/1! + X^2/2! - X^3/3! + \dots$

Note: You can't use the factorial operation in this program

- Write a program to print the following pattern where the number of rows in the pattern is a user input.

```

      1
    2 3 2
  3 4 5 4 3
4 5 6 7 6 5 4
5 6 7 8 9 8 7 6 5

```

- Write an iterative program to find factorial of a single digit number. Your program should also report the highest number up to which it can find the factorial successfully in your system.
- Write a program to find the number of digits in a number entered through the keyboard. Also find the sum of the digits of that number and check whether that number is a palindrome or not
- Write a program to print the sum of the following harmonic series for a given value of n:
 $1 + 1/2 + 1/3 + \dots + 1/n$

Home Assignments

- Write a program to print a Pascal's triangle for an input N, i.e.:

$(a + b)^0 =$	1	1
$(a + b)^1 =$	$a + b$	1 2 1
$(a + b)^2 =$	$a^2 + 2ab + b^2$	1 3 3 1
$(a + b)^3 =$	$a^3 + 3a^2b + 3ab^2 + b^3$	1 4 6 4 1
$(a + b)^4 =$	$a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$	1 5 10 10 5 1
$(a + b)^5 =$	$a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$	1 6 15 20 15 6 1

- Write an iterative program to print the first n terms of the Fibonacci sequence, where n is taken as input. NB: $f(0)=0$, $f(1)=1$
- Rewrite the program of Lab Assignment (1) of Week 4 using only conditional operator
- Write a program to print the following pattern:

```

      1
    2 2
  3 3 3
4 4 4 4
5 5 5 5 5

```

Week6: Basics of C Functions, Recursion

Lab Assignments:

1. Write a menu-driven program to –
 - Calculate the factorial of a given number,
 - Check whether the number is prime or not (Use square root approach),
 - Check whether the number is a palindrome or not.Use different functions for each of the above tasks and call the functions from main() using switch statement.
2. Write a recursive function to convert a decimal integer, taken as input, to its octal equivalent.
3. Write a recursive function to calculate the GCD of two numbers
4. Write a recursive function to print the first n Fibonacci numbers.

Home Assignments

1. A number will be provided as input along with its base (excluding hexadecimal base) and ask from the user to which base he or she wants to convert it (excluding hexadecimal base). Write separate functions for each possible conversion (it should be menu driven).
2. Write a recursive function to evaluate nC_r
3. Write a recursive function to calculate the sum of all digits of a number entered by the user.

Week 7: Arrays, Strings

Lab Assignments:

1. Write a menu driven program to find the max, min, average, standard deviation of the elements of an integer array using separate functions
2. Write a recursive function to find the maximum and minimum of a list of numbers
3. Write a program to read a line of text from the keyboard and convert it into a coded text by changing its characters by adding a code number to them. This code number must be taken as input. For checking the correctness of your program, you should get your original text back after encoding.
4. Write a program to read in a line of text and count the number of blank spaces, tabs and new lines in that line. Also rewrite the line of text with tabs and new lines replaced by the visible sequences '\t' '\n'
5. Write a program to find whether a given matrix is upper triangular or lower triangular.

Home Assignments:

1. Write a program to find the transpose of a matrix using function
2. Write a program to read a line of text and count the number of words and characters in that text.
3. Write a program to implement the following string related library functions using separate user defined functions:
a) strncpy () b) strcat() c) strncat() d) strcmp() e) strtok()

Week 8: Pointers, Dynamic Memory Allocation

Lab Assignments:

1. Write a program, using pointers, to multiply two matrices. Use dynamic memory allocation to allocate the matrices. NB: Check proper conditions for matrix multiplication.
2. Write a program, using pointers, that accepts a string and converts all its characters to upper or lower case
3. Write three functions, using pointers, to concatenate two strings, to compare two strings and to reverse a string, respectively. Test these functions in a complete program.

Week 9: Structures, File Handling

Lab Assignments:

1. Define a structure named student to store information of a student (roll, name, marksInPhysics, marksInChemistry, marksInMathematics). Write a program, which will take as input the roll, name and numbers obtained by several students in different subjects. The program will calculate the total marks obtained by each student and display the list of students in descending order according to the total marks
2. Write a program by using structure that describes the set of books in a library. For each book the members are name of author, publisher, price and branch information. The program should:
 - print the list of books supplied by a publisher
 - print the list of books in a particular branch in a file say "lib.txt"
3. Define a structure named employee to store information of an employee (empNo, name, department, basicPay, DA, HRA and grossSalary). Write a program, which will take as input the empNo, name, department, basicPay for several employees from a file named I_P.txt. The program will calculate the DA, HRA and total for each employee and display the details of the employee having the highest gross salary in a file O_P.txt