SIDDAGANGA INSTITUTE OF TECHNOLOGY, TUMKUR-572103

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
FOUNDATIONS OF COMPUTER PROGRAMMING LABORATORY
Common to all Branches

Lab Hours/ Week	: 4.0	Credits : 2.0
Sub. Code	: FCPL	CIE Marks : 50
		SEE Marks : 50

Instructions:

- **All the C programs need to be executed on Codeblocks IDE using GCC Compiler**
- **Algorithms & Flowcharts are compulsory for all the programs**
- **Demo experiments are only for assignment purpose, not to be included in examinations.**
- **All experiments must be included in practical examinations.**
- **Students are allowed to pick one experiment each from Part A and Part B from the lots.**

Demo Experiments

1. Demonstrate and explain the organization of a Personal Computer and its accessories.
2. Explanation of Concepts – Computer Software, Computing Environment, Computer Languages, Creating and running programs

Students have to prepare a write-up for the above demonstrations and include it in the Lab record for evaluation.

Part A

1. Write a program to calculate the total sales of a shop, given the unit price, quantity, discount rate and sales tax rate of a particular product. The sales tax is 8.5% which should be specified using a defined constant. The output should be displayed in proper form using appropriate format specifiers.

2. Write a program to extract and add the two least significant digits of an integer using the following user defined functions.

    i)Function that obtains the unit place digit of a given number

    ii)Function that obtains the tenth place digit of a given number

    iii)Function that adds unit and tenth place digits of a given number

    The main function should call these functions.

3. The following table shows the normal boiling points of several substances. Write a program that

reads a boiling point of a substance and identifies the substance if the input boiling point is within 5% of the expected boiling point

Substance	Normal Boiling Point ()
Water	100
Mercury	357
Copper	1187
Silver	2193
Gold	2660

For example if the input is 104 it lies in the 5% range of 100 which is from 95 to 105. Hence the substance has to be water

4   Write a program using switch statement, to find all the possible roots of Quadratic equation. Display suitable error messages for invalid inputs. Write a user defined function **fnCalcDiscriminant** to calculate the discriminant .

5   a) Write a program that takes the x and y coordinates of a point in the Cartesian plane and prints a message telling either the point is on the origin or an the axis on which the point lies or on the quadrant in which it is found.

Sample lines of output:

(-1.0, -2.5) is in quadrant III

(0.0, 4.8) is on the y-axis

b) Write a program to find Sine of an angle using the series

Sin (x) = x- x3/3! + x5/5!…….. For given N terms using the **for** loop structure. Also print Sin(x) using Library Function.

6   Write a program to display the calendar of a month whose starting day of the week and number of days in the month are given as input. (0,1,2,3...6 represent Sunday, Monday......Saturday respectively). Write a function printMonth which takes these values as parameters and prints the calendar of the month. Perform input validation as well.

7   Write a Program to calculate the area under the curve y = log(x) within a given left and right limit. Use trapezoidal approximation. Write an user defined function **fnTrapArea** to calculate the area of a trapezoid.

8   Write a recursive C function to find the factorial of a number, n!, defined by fact(n)=1, if n=0. Otherwise fact(n)=n*fact(n-1). Using this function, Write a program to compute the binomial coefficient nCr. Perform input validation as well.

9   Write a Program to generate Fibonacci series of N numbers using recursion, and write a Program in

C to find the value of 'x' raised to the power 'n' using recursion.

10   Write a program that reads N integer numbers and arrange them in ascending order using Bubble Sort technique. Extend the program to perform a search operation on these sorted numbers by accepting a key element from the user applying Binary Search method. Report the result SUCCESS or FAILURE as the case may be. Write user defined functions for the following

i) reads N integer numbers

ii) sorts N integer numbers in ascending order using bubble sort

iii) display N integers

iv) search for a key element using Binary Search

11   Write a program to implement sorting with the following user defined functions.

i) function to generate n random numbers in the range 0 to 999 and store it in an array.

ii) function to sort the array using selection sort

iii) function to sort the array using insertion sort

iv) display the elements of an array.

Part B

1   a) Write a program to find the Difference of two sets(sets have distinct elements)

       A - B = { X / X belongs to A and X does not belongs to B}

b) Write a program to find whether an array contains duplicate elements or not.

2   Write a program that reads a matrix of order M X N and fills the matrix by following:

a) Upper left triangle with 1's

b) Lower right triangle with -1's

c) Right to left diagonal with zeros

Check the necessity condition needed and display the contents of the matrix in proper format.

3   Write a program that reads two matrices **A (m x n)** and **B (p x q)** and Compute the product **A X B**. Read matrix A in row major order and matrix B in column major order. Print both the input matrices and resultant matrix with suitable headings and in matrix format. Display the trace of the matrix if it exists. Program must check the compatibility of orders of the matrices for multiplication. Report appropriate message in case of incompatibility.

4   Write a program to find the smallest and largest elements in an array using pointers and then swap these elements and display the resultant array.

5   Write a program that reads the length, breadth and height of a cuboid. The program has to calculate the surface area and volume of the cuboid using the function **fnCalcVolSurfArea**. The results are

then to be displayed by the main function. (Hint: use pass by reference)

6   Write a Program to implement Caesar Cipher. Input a message and then encodes it by replacing each character in the message by a character that is three positions ahead in the English alphabet sequence, wrap back to 'a' if the character is 'z'. Display the encoded message. Decode the message using the inverse procedure and display it.

7   Write a program to read a line of text from the keyboard and print the number of occurrences of a given substring using the builtin function strstr().

8   Write a program to read two strings and then determine whether they are identical or not using a user defined function **fnMyStrCmp** which takes these strings as parameters. Display the result in the main function

9   Write a program that stores the details of 5 bowlers given by the user. The following are the information stored for each bowler

i)Name ii)Nationality   iii)No of matches played   iv)No of Wickets taken

v)No of overs bowled   vi)No of runs conceded

Then find and display details of

i)the most economic bowler

ii)the bowler with the best strike rate

10   Write a program that create a structure to represent a point in a cartesian plane. The program has to read coordinates of two points as input. Using a user defined function **fnCalcDistance** which takes these points as parameters calculate the distance between the two points. Display the result in the main function. (Hint : use Distance formula)

11   Write a program that reads an unsigned integer and then perform the following operations using user defined functions

i) **fnSetBit** - sets a specified bit to 1

ii) **fnMaskBit** - masks a specified bit to 0

References:

Part A: Behrouz A. Forouzan , Richard F. Gilberg , **Computer Science: A Structured programming Approach Using C** - Cengage Learning; 3rd edition

For writing flowcharts refer to **Appendix C** of the above book.