C Programming and Data Structures Lab Manual

Principal Record

SRI CHAITANYA
TECHNICAL CAMPUS
COLLEGE OF ENGINEERING & TECHNOLOGY
COLLEGE OF BUSINESS MANAGEMENT
(Approved by AICTE, NEW DELHI & Affiliated to JNTU, Hyderabad)

www.srichaitanyaengg.com
E-mail : director8a.sctc@gmail.com

Sheriguda (V), Ibrahimpatnam (M), R.R. Dist. - 501 510 - A.P.
Ph : 08414 - 223222, 223223 Fax : 08414 - 222678

MCA I Yr. - I Semester

SRI CHAITANYA
TECHNICAL CAMPUS

COLLEGE OF ENGINEERING & TECHNOLOGY
COLLEGE OF BUSINESS MANAGEMENT

(Approved by AICTE, NEW DELHI & Affiliated to JNTU, Hyderabad)

Sheriguda (V), Ibrahimpatnam (M), R.R. Dist. - 501 510 - A.P.

CERTIFICATE

This is to certify that Mr / Ms _____ has satisfactorily completed experiments in C Programming and Data Structures Lab laboratory as prescribed by Jawaharlal Nehru Technological University, Hyderabad.

Department Master of Computer Applications Roll No_____

Branch MCA Academic Year 2025-2026

INTERNAL EXAMINER HEAD OF THE DEPT.

EXTERNAL EXAMINER PRINCIPAL

INDEX

Sl.No.	Date	Name of the Experiment	Page No.	Remarks

C PROGRAMMING & DATA STRUCTURES LAB

MCA I Year I Sem.

L	T	P	C
0	0	3	1.5

Prerequisites:

1. Requires analytical skills and logical reasoning

Course Objectives:

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes:

- Develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
- Implement searching and sorting algorithms

Week 1:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.

Week 2:

5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 3:

9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices
    ii) Multiplication of Two Matrices

Week 4:

11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.

Week 5:

15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$1+x+x^2+x^3+ \ldots\ldots\ldots\ldots+x^n$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

Week 6:

18. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:

20. Write a C program that uses functions to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 8:

21. i) Write a C program which copies one file to another.
    ii) Write a C program to reverse the first n characters in a file.
    (Note: The file name and n are specified on the command line.)
22. i) Write a C program to display the contents of a file.
    ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Week 9:

23. Write a C program that uses functions to perform the following operations on singly linked list.:
    i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 10:

24. Write C programs that implement stack (its operations) using
    i) Arrays ii) Pointers
25. Write C programs that implement Queue (its operations) using
    i) Arrays ii) Pointers

Week 11:

26. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
    i) Bubble sort ii) Selection sort

Week 12:

27. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
    i) Linear search ii) Binary search

TEXT BOOKS:

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, 3rd Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 5th Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES:

1. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

DEPARTMENT OF Masters of Computer Application

Vision & Mission

Vision

* To achieve high quality in technical education that provides the skills and attitude to adapt to the global needs of the Information Technology sector, through academic and research excellence.

Mission

* To equip the students with the cognizance for problem solving and to improve the teaching learning pedagogy by using innovative techniques.

* To strengthen the knowledge base of the faculty and students with motivation towards possession of effective academic skills and relevant research experience.

* To promote the necessary moral and ethical values among the engineers, for the betterment of the society.

Quality Policy

* Strives to inculcate the students with the world class Technical Knowledge, Entrepreneurial Competence and Social Ethics by providing continual improvement and innovation in the curriculum; based upon well-defined measurements and best practices.

* Develop faculty competencies, creativity, empowerment and accountability through faculty development programs and show strong management involvement and commitment.

GENERAL LABORATORY INSTRUCTIONS

1. Students are advised to come to the laboratory at least 5 minutes before (to starting time), thosewho come after 5 minutes will not be allowed into the lab.

2. Plan your task properly much before to the commencement, come prepared to the lab withthe synopsis / program / experiment details.

3. Student should enter into the laboratory with:

- **a.** Laboratory observation notes with all the details (Problem statement, Aim, Algorithm,Procedure, Program, Expected Output, etc.,) filled in for the lab session.
- **b.** Laboratory Record updated up to the last session experiments and other utensils (if any)needed in the lab.
- **c.** Proper Dress code and Identity card.

4. Sign in the laboratory login register, write the TIME-IN, and occupy the computer system allotted to you by the faculty.

5. Execute your task in the laboratory, and record the results / output in the lab observationnote book, and get certified by the concerned faculty.

6. All the students should be polite and cooperative with the laboratory staff, must maintain thediscipline and decency in the laboratory.

7. Computer labs are established with sophisticated and high end branded systems, which shouldbe utilized properly.

8. Students / Faculty must keep their mobile phones in SWITCHED OFF mode during the lab sessions. Misuse of the equipment, misbehaviors with the staff and systems etc., will attract severe punishment.

9. Students must take the permission of the faculty in case of any urgency to go out ; if anybody found loitering outside the lab / class without permission during working hours willbe treated seriously and punished appropriately.

10. Students should LOG OFF/ SHUT DOWN the computer system before he/she leaves the lab after completing the task (experiment) in all aspects. He/she must ensure the system / seat is kept properly.

Lab In-charge **Head of the Department** **PRINCIPAL**

Program-1

Write a c program to find the sum of individual digits of a positive integer

```
#include<stdio.h>
#include<conio.h>void main()
   {
    int n,digit=0,sum=0;clrscr();
    printf("Enter a number is to check pallindrome:");
   scanf("%d",&n);
   while(n!=0)
   {
    digit=n%10;
    sum=sum+digit;n=n/10;
   }
    printf("\nThe sum of individual digits of entered number is %d",sum);

   getch();
   }
```

OUTPUT:

Enter a number is to check pallindrome:12321

The sum of individual digits of entered number is:9

Program-2

write a c program to find Fibonacci series upto n value

```
 #include<stdio.h>
 #include<conio.h>
void main()
   {
    int n,a,b,c;
    clrscr();
    printf("Enter a number to find fibonacci series:");
    scanf("%d",&n);
  a= 0;   b=1;
   printf("%d\t%d",a,b);c=a+b;
    while(c<n)
    {
printf("\t%d",c);a=b;
b=c; c=a+b;
    }
   getch();
   }
```

OUTPUT:

```
Enter a number to find fibonacci series:4
0       1       5
```

Program-3

write a c program to generate prime numbers sequence from 1 to n

```
#include<stdio.h>
#include<conio.h>void
main()
{
 int n,i,j,fact;clrscr();
 printf("Enter any number to generate prime number series:");
 scanf("%d",&n);
 for(i=1;i<=n;i++)
{
  fact=0; for(j=1;j<=i;j++)
 {
  if(i%j==0) fact=fact+1;
 }
 if(fact==2) printf("%d ",i);
}
 getch();
}
```

OUTPUT:

Enter any number to generate prime number series:15

1 2 3 7 11 13

Program-4

Write a C program to find the roots of quadratic equation

```
#include<stdio.h>
#include<conio.h>
#include<math.h>          void
main()
{
int a,b,c; float d,r1,r2;
clrscr();
printf("Enter a,b,c values");
scanf("%d%d%d",&a,&b,&c);
d=(b*b)-(4*a*c);if(d==0)
{
printf("\nEnter roots are real and same");r1=-b/2*a;
r2=-b/2*a;
printf("\nroot1=%f and \nroot2=%f",r1,r2);
}
else if(d>0)
{
printf("\n roots are real and different");r1=(-
b+sqrt(d))/2*a;
r2=(-b-sqrt(d))/2*a;
printf("\nroot1=%f and \nroot2=%f",r1,r2);
}
else
{
printf("The roots are imaginary");
}
getch();
}
```

OUTPUT:

Enter a,b,c values: 1 6 5

roots are real and different

Program-5

Write C programs to find the factorial of a given integer.

Program:

```
#include   <stdio.h>   #include
<conio.h>int recfact(int n);
int nonrecfact(int n);void main()
{
int x, a, b;
clrscr();
printf("Enter any number\n");scanf("%d",
&x);
a = recfact(x);
printf("The factorial of a given number using recursion is %d \n", a);b =
nonrecfact(x);
printf("The factorial of a given number using nonrecursion is %d ", b);getch();
}
int recfact(int n) // function-1 definition
{
int res; if(n == 0)
 {
res=1;
 }
else
 {
res = n * recfact(n - 1);return res;
 }
}
```

```
int nonrecfact(int n) // function-2 definition
{
int i, fact = 1;while(n>0)
{
fact = fact * n;n--;
}return fact;}
```

OUTPUT:

Enter any number: 4

The factorial of a given number using recursion is 24

The factorial of a given number using no recursion is 4

Program-6

Write a simple program that prints the results of all the operators available in C (including pre/post increment, bitwise and/or/noted.).Reads required operandvalues from standard input.

```
#include<stdio.h>
#include<conio.h>Void  main(
)
{
int a,b;
printf("enter the value of a and b");scanf("%d
%d",&a,&b);
printf("the arithemetic operators results is %d %d %d %d",a+b , a-b, a*b, a/b); printf("the
relational operators results is %d %d %d %d", a>b, a<b, a>=b, a<=b);printf("the logical
operators results is %d %d %d %d", a&&b, a||b,!(a==b)); printf("the increment operator
result is %d %d %d %d", a++,++a, b++,++b); printf("the decrement operators results is %d
%d %d %d", a--,--a, b--,--b); printf("the bitwise AND operators results is %d",a&b);
printf("the bitwise OR operators results is %d",a|b); printf("the
bitwise NOT operators results is %d",a^b);getch();
}
```

OUTPUT:

```
enter the value of a and b 15 5
the arithmetic operators results is 20 10 75 36
the relational operators results is 15>5 15<5 15>=5 15<=5
the logical operators results is 15&&5 15||5 !(15==5)
the increment operator result is 15 16 5 6
the decrement operators results is 15 14 5 4
the bitwise AND operators results is 15&5
the bitwise OR operators results is 15|5
the bitwise NOT operators results is 15!5
```

Program-7

Write a c program to perform Addition of two matrices using two dimensional array

```
#include<stdio.h>
#include<conio.h>  void
main()
{
int i,j,m,n,t;
int a[100][100],b[100][100],sum[100][100];
clrscr();
printf("Enter the size of rows(m) and columns(n):");
scanf("%d %d",&m,&n);
t=m*n;
printf("Enter the %d elements of first matrix:",t);
for(i=0;i<m;i++)
{
 for(j=0;j<n;j++)
  {
   scanf("%d",&a[i][j]);
  }
}
printf("First matrix %d elements are:\n",t);
for(i=0;i<m;i++)
{
 for(j=0;j<n;j++)
  {
   printf("%d\t",a[i][j]);
  }
  printf("\n");
}
printf("Enter the %d elements of second matrix:\n",t);
for(i=0;i<m;i++)
{
 for(j=0;j<n;j++)
  {
   scanf("%d",&b[i][j]);
  }
}
printf("Second matrix %d elements are:\n",t);
for(i=0;i<m;i++)
{
 for(j=0;j<n;j++)
  {
   printf("%d\t",b[i][j]);
  }
  printf("\n");
```

```
}
printf("The sum of two matrices elements are:\n");
for(i=0;i<m;i++)
{
 for(j=0;j<n;j++)
  {
   sum[i][j]=a[i][j]+b[i][j];
   printf("%d\t",sum[i][j]);
  }
  printf("\n");
}

getch();
}
```

OUTPUT:

Enter the size of rows(m) and columns(n) 2 2

First matrix elements are 3 5

second matrix elements are 6 7

Program-8

Write a c program to perform Multiplication of two matrices using two dimensional array:

```
#include<stdio.h>
#include<conio.h>       void
main()
{
 int i,j,m,n,t;
 int a[100][100],b[100][100],mul[100][100];
 clrscr();
 printf("enter the size of rows(m) and columns(n):");
 scanf("%d %d",&m,&n);
 t=m*n;
 printf("Enter the %d elements of first matrix:",t);
 for(i=0;i<m;i++)
 {
  for(j=0;j<n;j++)
   {
    scanf("%d",&a[i][j]);
   }
 }
 printf("First matrix %d elements are:\n",t);
 for(i=0;i<m;i++)
 {
  for(j=0;j<n;j++)
   {
    printf("%d\t",a[i][j]);
   }
   printf("\n");
 }
 printf("Enter the %d elements of second matrix:\n",t);
 for(i=0;i<m;i++)
 {
  for(j=0;j<n;j++)
   {
    scanf("%d",&b[i][j]);
   }
 }
 printf("Second matrix %d elements are:\n",t);
 for(i=0;i<m;i++)
 {
  for(j=0;j<n;j++)
   {
    printf("%d\t",b[i][j]);
   }
   printf("\n");
 }
 printf("Multiplication of two matrices elements are:\n");
 for(i=0;i<m;i++)
 {
  for(j=0;j<n;j++)
  {
mul[i][j]=a[i][j]*b[i][j];
     printf("%d\t",mul[i][j]);
```

```
  }
  printf("\n");
}

 getch();
}
```

OUTPUT:

Enter the size of rows(m) and columns(n) 2 2

First matrix elements are 3 5

second matrix elements are 6 7

The sum of two matrices elements are

Program-9

Write a C Program to display the given string is pallindrome or not

```
#include<stdio.h>
#include<conio.h>
#include<string.h>          void
main()
{
 char str1[50],str2[50];clrscr();
 printf("Enter the string1:");gets(str1);
 strcpy(str2,str1); strrev(str2);
 if(strcmp(str1,str2)==0)
 printf("Given string is Palindrome");else
 printf("Given string is not palindrome");
 getch();
}
```

OUTPUT:

Enter the string1**:** pop

Given string is Palindrome

Program-10

Write a C program to print right half pyramid pattern of star

```
#include <stdio.h>
 #include<conio.h>void main()
{
        int rows = 5;

        // first loop for printing rowsfor (int i = 0; i
        < rows; i++)
        {

                // second loop for printing character in each rowsfor (int j = 0; j
                <= i; j++)
                {
                        printf("* ");
                }
                printf("\n");
        }
        getch();
}
```

OUTPUT:

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

www.srichaitanyaengg.com
E-mail : director8a.sctc@gmail.com

SRI CHAITANYA TECHNICAL CAMPUS

COLLEGE OF ENGINEERING & TECHNOLOGY
COLLEGE OF BUSINESS MANAGEMENT

(Approved by AICTE, NEW DELHI & Affiliated to JNTU, Hyderabad)

Sheriguda (V), Ibrahimpatnam (M), R.R. Dist. - 501 510 - A.P.

Ph : 08414 - 223222, 223223 Fax : 08414 - 222678