Programming in C **(Tutorial)**

UNIT 1

1. What do you mean by programming language? Explain machine language, assembly language and high level language.
2. Why high level programming is preferred over low level programming language? Explain advantages and disadvantages of high level programming language and low level programming language.
3. What do you mean by language translation? Differentiate compiler and interpreter.
4. Explain different types of software with suitable examples.
5. Explain different generation of programming language.
6. Explain the concept of structured programming.
7. Discuss the Significance of Algorithm and Flowchart in Programming.
8. What are the different steps in problem solving using computer? Briefly explain each step.
9. Write an Algorithm and flowchart to find the number given by user is divisible by 2,3, and 6 or not.
   (Perform similar operation to check the number is exactly divisible by 5 but not 7)
   (perform similar operation for whether it is even and divisible by 3)
10. Draw a flowchart for finding greatest digit for the supplied number by user**.**
11. Write short notes on:
    - Debugging and testing
    - Errors in programming

(Practice algorithm and flowchart for Lab 2 and Lab 3)

UNIT 2

1. Explain the following terms:
   i. C as a middle level language
   ii. C as a system programing language
2. Define the following terms with suitable examples.
   - Character set
   - Token
3. Why it is necessary to have knowledge of data type in C programming. Explain all types of data types of data type available in C.

   OR

   (What are different data types available in C? Explain their type's qualifier, conversion character, range of value and storage size in memory occupied by each type)
4. How can you declare following variables using suitable data types? Mobile phone numbers, address, body, temperature, salary. Also explain each memory occupancy size and range
   (Perform similar operations for Registration number, Account number, age, weight, distance jumped by frog, Examination symbol number of student, Prime number between 5 and 555)
5. Define operator and operand. List the types of operators and explain any five of them.
6. Describe about the unary operator, binary operator and ternary operator with example.
   OR
   Describe different types of operators on the basis of number of operand.
7. Differentiate between keywords and identifier. Write the rules of naming identifiers in C?

8. Differentiate between variables and constants. Which of the following are invalid variable name and why?

Minimum	First.name	Row Total	&name
Doubles	3rd_row	Column-total	integer

9. What do you mean by formatted and unformatted i/o functions in C programming. Explain different formatted i/o functions with suitable examples.
10. Write short notes on:

- History of C language
- Features of C
- ASCII
- Format specifier

UNIT 3

1. Describe the different types of decision control statements used in C programming with their syntax.
2. What are control statements? Explain all looping statements in C with examples.
   (Explain the different types of looping constructs available in C with suitable examples).
3. What do you mean by selective and repetitive statement?
4. Differentiate between while and do while loops with suitable examples.
   (Explain entry controlled and exit controlled loops with examples)
5. Differentiate pre-test and post-test loop.
   [Hint for solution: while and for loop are pre-test loop and do while is post-test loop]
6. Why do you use "continue" and "break" statement in your program? Explain with suitable example program
7. What is (menu driven structure/switch case statement) explain with suitable examples.
8. An electricity board charges according to the following rates.
   For the first 100 units …… Rs 40 Per Unit
   For the next 200 units…….Rs. 50 Per Unit
   For the beyond 300 Units…….Rs.60 Per unit
   All users are also charge meter charge. Which is equal to Rs.50. Write a program to to read number of units consumed and print out total charges.
9. An electricity board charges according to following rates.
   For the first 20 units…….. Rs 80
   For the next 80 units……..Rs.7.5 per unit
   For the next 100 units …Rs 8.5 per unit
   For the beyond 200 units ….Rs 9.5 per unit
   Additional charge: Tax 15% in total amount and Rs.100 for maintenance.
   Write a program to read number of units consumed and print out the total charges.
10. WAP to print prime number from 1 to 200.
11. Write a program to print even numbers from 51 to 100.
12. Write a Program to generate Fibonacci series as per user choice.

13. Write a menu driven program to work following cases, take appropriate input whenever required.
    1. Reverse a number
    2. Find sum of individual unit
    3. Display all ASCII characters from 0 to 255
    4. Check for prime
    5. Exit
14. Write a program to display the following menu
    1. Conversion of ASCII code to char
    2. To find the sum of n natural numbers
    3. Exit from the program

    and perform task as per users choice repeatedly until his/her choice is to exit
15. Now practice the following program using switch case

- Program to check the given number is palindrome or not.
- Program to Check the given number is Armstrong number or not
- Program to display multiplication table of a given number.
- Program to find factorial of a given number
- Program to find sum of even number between 20 to 200

UNIT 4

- What is array?
- Why do we use array in programming language?
- Limitation of Array
- Why array is called static data type?
- Why array is important in programming? How can you initialize different types of arrays? Explain 2-dimensional array in C.

1-D array

1. WAP to read n elements in array and display them in reverse order.
2. WAP to read n numbers in an array and find the sum of even numbers and odd numbers and count them also.

   Now,
   - *Sum of all numbers*
   - *Find the sum of odd numbers only*
   - *Find the sum of even numbers only*

3. Write a program to read n number from keyboard and find the smallest and largest number using array.
   (Write a C program using array to find largest and smallest number from the list of 100 given numbers).
4. WAP to check whether the given number is present in an array or not and if present find its position.
   (Write a program to search an element in one-dimensional array containing five integer elements)
5. WAP to input n number in an array and sort them in **Ascending** order.
   - *WAP to input n number in an array and sort them in **Descending** order.*
   - *WAP to read marks of n students and print the marks of top five.*

2-D array

6. WAP to input m*n order matrix and find the sum of all elements.
   Now similarly, perform the following operations:
   a) Sum of even elements
   b) Sum of odd elements
   c) Sum of diagonal elements(Main diagonal)
   d) Sum of diagonal elements from Right
   e) Sum of each row
   f) Sum of each column
   g) Sum of particular row
   h) Sum of particular column

   *(Perform above operations for 3*3 matrix)*

7. WAP to input m*n order matrix and find its transpose
   *(Perform similar operations for 3*4 matrix)*
8. WAP to input m*n order matrix and convert it to the upper triangular matrix.
   (Perform similar operation for lower triangular matrix)
9. Write a program to add two 3X3 matrix. Display the sum stored in third matrix
   (Perform similar operation for matrix subtraction)
10. WAP to read m*n order matrix and find the largest element among them.
    (Perform similar operation to find smallest element)
11. WAP to read two m*n matrix and multiply them if possible.
12. WAP to test whether given two matrix are equal or not.

String

13. Define string. Explain string handling functions with suitable example.
14. WAP to sort n students name in alphabetical order.
    (Write a program to read n employees names and display them in alphabetical order).
15. Write a program to check whether the given string is palindrome or not.(palindrome is a word which reads same from left to right and right to left.eg LIRIL,MADAM etc.
16. Write a program to insert a given character at a given array index of a given string. For example if the given string is "Gnesh", given character is 'a, and the given array index is 1,the resulting string should be "Ganesh".

    OR

    Write a program to insert a given character in the array index of string. For example if the string is 'Nepl',given character is 'a', and the given array index is 3,resulting string should be Nepal.
17. *Write a program to input a string and count the number of vowels present in it.*

WAP to print the following pattern

1P 2PR 3PRO 4PROG 5PROGR 6PROGRAM 7PROGRAMM 8PROGRAMMI 9PROGRAMMIN 10PROGRAMMING	PROGRAMMING PROGRAMMIN PROGRAMMI PROGRAMM PROGRAM PROGRA PROGR PROG PRO PR P	P PR PRO PROG PROGR PROGRAM PROGRAMM PROGRAMMI PROGRAMMIN PROGRAMMING

UNIT 5

1. Write the basic structure of C program.
2. Without using functions also we can write a program. But we need functions in our program. What are the benefits of using them.
3. Define function, function definition, function calling, function declaration with code example.
4. Why header files in C are included in program? Give reasons. Also list out different header files you know. Illustrate the program showing the use of header file.
5. Distinguish between call by value and call by reference with examples.
6. What do you mean by storage class? Explain different types of storage classes in C? Use examples to illustrate.

Function

1. WAP find the area of two spheres having different radius using user-defined function.
2. WAP to find reverse of a given number using user-defined function.
3. WAP to find sum of even numbers from n1 to n2 using user-defined function
4. WAP to check the given number is prime or not using user defined function.
   (Practice other program of chapter 4 using function)

Recursive Function:

1. What is Recursive function? List out it's advantages and disadvantages.
2. WAP to find the factorial of a given number using recursive function
   - *Write a program to find the sum of first n natural number using recursive function*
   - *WAP to find the sum of numbers from 1 to 50 using recursive function.*
3. Write a program to generate the Fibonacci series upto nth term using recursive function. Fibonacci series is 0,1,1,2,3,5,8….
   - Write a recursive program to generate the first 25 numbers of Fibonacci series.
   - Write a recursive program to generate 20 terms Fibonacci sequence starting from 2
4. Write a program to find nth term of Fibonacci number using recursive function.
5. Write a program to read an integer number and find the sum of digits using recursive function.
   (Write a program to read an integer and find the number of digits present in it using recursive function).
6. Write a recursive program to raise the power of X to n. (i.e. X^n).

Passing 1D Array to function

- Write a program to pass one dimensional array to a function and display that array in that called function.
- Write a program to find the sum of all prime numbers in a given array. The main function of your program should take the help of user-defined function that tests whether a given number is prime or not
- *(Using User-defined function write a program, for unit 4* ***Que .No 1 to 5)***

Passing 2d Array to function

1. Write a user-defined function to find the sum of elements of m*n matrix and finally returns the sum to the calling function.
   (Using User-defined function write a program for unit 4 ***Que .No 6a), 6b),7,10,11)***

UNIT 6

- What is a pointer in c?
- What are the advantages of using pointer?
- What are the advantages of using pointer in a function?
- Does function return single or multiple value? When and how a function will return single or multiple value? Illustrate with examples.

Pointer to 1-D Array

1. WAP using pointer to read an array of integers. Next add the elements in the array and display sum on screen.
2. Write a program using pointers to read in an array of integers and prints its elements in reverse order.
3. Write a program to sort n integer values in an array using pointer.
   (Using User-defined function write a program for chapter 5 ***Que No. 2,3,4)***

Pointer to 2-D Array

Using pointer write a program for chapter 5. Que No. 7(a), 7(b),8,10,11

Passing Array to function using Pointer

4. Write a program to pass array element to a function using pointer.
5. Write a program to pass the elements of array to a function using pointer and use function to find the sum of elements and find the sum.
   *By passing array element to a function using pointer write a program for Unit 4****Que No. 1, 2,3,4,5***

Dynamic Memory Allocation (DMA)

1. Why Dynamic Memory allocation is necessary? Differentiate Static memory allocation and Dynamic Memory allocation.
2. How dynamic memory allocation can be achieved? Explain with suitable examples.
3. Program to find sum of n elements of an array using Dynamic memory allocation.
4. Write a program to sort an array using dynamic memory allocation.
5. Write a program to print reverse element of an array using dynamic memory allocation.
   (WAP for remaining Questions for chapter 5 ***Que .No 1 to 5*** *Using dynamic memory allocation)*
6. Write a program to find highest number in an array using dynamic memory allocation and function

UNIT 7

- Define structure. Explain why structure is needed?
- How members of the structure are accessed? Show it with example.
- What is nested structure? How the members of the nested structure are accessed? Show it with example.
- How to declare and initialize array of structure variables?
- Compare and contrast structure with union with example codes.

1. Create a structure for the following data.

Emp_name	Address	Salary	Department	Date of Birth		
				mm	dd	yy

Also write a program to input 100 employee records and display whose Department is “sales”

Perform following operations for above questions

- Display information of employee whose name is sachin
- Display information of employee whose salary is greater than 10, 000
- Display information of employee whose age address is Kathmandu
- Display information of employees who are not from "pokhara"
- Display the information of Employee who has highest salary
- Display information of employee who born in july month
- Display information of employee who was born in 1995
- Display all the information of employee

2. Create a structure called student with data members name, rollno, and marks of five subjects for 100 students. Display the name of students with average marks greater than 80.

UNIT 8

- What is file? Why file handling is needed in C program?
- What is the significance of file pointer in file handling?
- Discuss the role of file handling technique in C programing.
- Describe the different file opening modes in C

1. WAP to open a new file and read name, address and telephone number of 10 employees from a user and write to a file
   (Write a program to create a file "hello.txt", write data info to the file and finally read from the file)
2. Program to display the information stored in above file "hello .txt"

Model 1(Write to the file and Read from the file)

- Write a program to read the name, author and price of 200 books in a library and store the information into file "library.dat".Also print the book name and price of those books whose price is above Rs.350.
- Write a program to input name, address, faculty, program and GPA(in maximum 4.0) of 500 students and store them in 'RESULT.DAT' data file and display the records of those student whose faculty is 'Engineering' and GPA>3.5.
- Consider the following structure:

Roll No	Name	Address	Faculty	Date of Birth		
				Mm	dd	Yy

Write a program to create "student.txt" file to store the above records for 100 students and display the records of student who are not from pokhara.

This Question can be modified in following ways

- Display the records of students of computer faculty
- Display the records of students who are from Kathmandu
- Display the records of students whose name is Anish
- Display the records of students who born in January
- Display the records of students who born in 1998
- Display the records of students whose address is Kathmandu and faculty is civil
- Display the records of student whose faculty is Electronics but not from Butwal

Model 2 (Write to the file only)

- Write a program to read the name, author and price of 200 books in a library and store the information into file "library.dat".Also print the book name and price of those books whose price is above Rs.350.
- Write a program to create structure for the following data for student (RN, Name, phone, address and semester).Read the 10 students by user and write only those students whose semester is 1 in file "student.txt"
- Create a structure called goods that stores number, price, purchase date and quantity. WAP to store information of 100 goods in the file "good.dat"

Roll.No.	Name	Address	Faculty	Date of Birth		
				mm	dd	yy

Write a program to create "student.txt" file to store the above records for 100 students.

Model 3 (Read from the file only)

1. Write a program to read the name ,author and price of 200 books in a library from the file "library.dat".Now print the name and price of those books whose price is above Rs.300

Model 4 (Append to the file and Read from the file)

- Write a program to input name, address, registration no, faculty and academic year of admission in university of 'n' number of students of Pokhara University and append them in data file called 'STUDENT.DAT'. Then display the records of those students by reading the records from 'STUDENT.DAT' data file who got admission in 2016.
- An organization has a file named "staff.txt" that has 10 records of staffs having their id, name and salary. Using the concept of structure, you are required to write a program to ask the details of three more staffs and add them in the file. Also, finally you need to display all the records and the total salary paid by the organization.

Write a short notes on:

- Debugging and Testing
- SDLC
- Compilation Process
- Documentation
- Binary and unary operators
- Basic data type in C
- Pseudo code
- Escape Sequence
- The switch statement
- Nested loop
- Go to statement
- Multidimensional Array
- String handling function
- Macros
- Local vs Global variable
- Preprocessor directives
- Header files
- Recursive function
- Library function vs User defined function
- Macro vs Function
- Storage class in C
- Malloc() vs Calloc()
- Memory Leak
- Self -Referential Structure
- Differences between structure and union
- Union in C
- File opening in C
- Getc() and Putc()
- Void pointer
- Pointer Arithmetic.
- Array of pointer
- Difference between array and pointer
- Pointer to Array
- Array of pointer vs Pointer to array