Tutorial 3

1. Write down the *flowchart of nested* if in C and explain how it works?
2. Explain **break** and **goto** statement with examples.
3. Write a program that will read the value of x and evaluate the following function:

$$y = \begin{cases} 1 \; for \; x > 0 \\ 0 \; for \; x = 0 \\ 1 \; for \; x < 0 \end{cases}$$

Using

- *nested if* statement,
- *else if* statement,
- Conditional operator.

4. What is the purpose of **break** statement in switch? Explain with examples.
5. Why the use of **goto** statement is generally discouraged in C programming?
6. Compare conditional operator and *if-else* statement with examples.
7. In a control structure *switch-case*, explain the purpose of using default.
8. WAP in C to accept three digits (0-9) and print all possible combinations from these digits. (For example, if three digits are 2, 3 and 5 then all possible combinations are 235, 253, 325, 352, 523, and 532).
9. WAP in C to find the smallest and largest of 3 numbers given by users.
10. WAP in C to find the area of a circle, rectangle or triangle depending upon the user's choice.
    - Using if-else-if ladder
    - Using switch
11. In any program, using switch statement, *if all break statements are removed from all cases* of switch statement, how does it affect the functionality of switch statement? Give example.
12. While purchasing certain items, a discount of 10% is offered if the quantity purchased is more than 1000. If quantity and price per item are input through the keyboard, write a program to calculate the total expenses.
13. According to the Gregorian calendar, it was Monday on the date 01/01/01. If any year is input through the keyboard write a program to *find out what is the day on 1st January* of this year.
14. Given three points (x1, y1), (x2, y2) and (x3, y3), write a program to *check if all the three points fall on one straight line*.
15. WAP using conditional operators to determine whether a year entered through the keyboard is a **leap year** or not.
16. Give the syntax of **for** loop and explain how it works, with an example and flowchart.
17. Compare **for loop**, **while loop** and **do…while loop** with flowchart and example.
18. Explain the difference between **break** and **continue** statements of C language *with flowchart and example*.
19. WAP in C to print the multiplication table of a number. (Number given by user)
20. WAP in C to generate multiplication table of 1 to 10. Draw flowchart.

Last Date of Submission: **Magh 21, 2074**

21. WAP in C to generate and display a table of **n** and $\mathbf{n^2}$, for integer value of n ranging from ***10 through 20*** along with appropriate column headings.
22. WAP to generate Nepali Flag filled with smiling face. The smiling face has an ASCII value 1.
23. WAP to generate all combinations of 1, 2 and 3 using for loop.
24. According to a study, the approximate level of intelligence of a person can be calculated using the following formula:

    $$i = 2 + (y + 0.5x)$$

    Write a program that will produce a table of values of i, y and x, where y varies from 1 to 6, and, for each value of y, x varies from 5.5 to 12.5 in steps of 0.5.

25. WAP to read the number until -1 is encountered. Also count the number of **even** number and **odd** number entered by user.
26. Why do we include <stdio.h> in our program? Can we write a C program *without using any header file*? Justify your answer.
27. What is the importance of control structure in programming? Compare **if-else-if ladder** and **switch construct**. Which is better?
28. What is user-defined function? Why is it necessary in programming? How function is categorized in C?
29. WAP to find whether a number is prime or not using function. The function should take the number as argument and return true or false to the main program.
30. WAP in C that calculates the sum of digits entered by user successively until the sum reduces to a single digit number. For example, 12345 =>1+2+3+4+5 = 15 =>1+5 = 6. Your program should print sum at each step.
31. WAP in C to calculate the frequency (F) for different values of Capacitance (C), for a certain electrical circuit with an Inductance (L) and Resistance (R), the damped natural frequency is given by

    $$F = \sqrt{\frac{1}{LC} - \frac{R^2}{4C^2}}$$

    It is required to study the variation of this frequency with capacitance starting from 0.01 to 0.1 in steps of 0.01, and calculation should be done using user defined function.

32. You are given a task to develop a system to read at least 50 integer numbers and continue until the user enters NO. Your system must have capacity to calculate the sum and average of those numbers which are exactly divisible by 9 but not by 6 and lies in between 1 to 100 and display a suitable message if no such number is read. Write algorithm and flowchart to develop such system.
33. How **recursion** is different from **iteration**? Write code in C to calculate the sum of following series up to n terms specified by the user where n is passed to the function that calculates the sum. Your program should have more than two functions. (2*3/5)+(4*5/7)+(6*7/9) + ….. to n terms.
34. Write an algorithm and flowchart of the distance between two points (x1,y1) and (x2,y2), govern by formula $D^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$. Where x1, x2,y1,y2 are given by user but should not be zero. Write program also.

35. State with example, how **switch**() differs from **user-defined function** in computer programming language C.
36. Draw a flowchart and then write a program to read three sides of a triangle and print area for valid data and to print "Invalid data" if the given data doesn't form valid triangle. (Area = $\sqrt{s(s-a)(s-b)(s-c)}$, where a, b, c are three sides and $s=(a+b+c)/2$.
37. WAP in C to calculate the sum of given series up to the term given by the user:

$$Y = 1/x - 2/x^2 + 3/x^3 - 4/x^4 + \cdots \; to \; n \; terms$$

38. WAP in C which calculates F, where $F=(a*b^n)/c!$ and n is an integer. For designing above program, use two functions, one calculates factorial and other calculates power of a number.
39. Write algorithm and flowchart to find greatest number among three numbers entered by user.
40. WAP to read integers from the user. Pass it to functions that calculates the H.C.F. and L.C.M. Display the result from main function.
41. Write an interactive program that reads positive numbers until user enters "no" and then sum the numbers divisible by 4 that lie between the range of 10 and 50 and finally display the count and average value.
42. WAP using recursion to compute the sum of the following series: $1^2 - 2^2 + 3^3 - 4^4 + \cdots + (-1)^{n+1}n^2$ without using pow() function. You should read the value of n from user.
43. How does a *function optimize resources at the programmer and the machine side*? How does a function return value? Illustrate with example.
44. WAP to read number and call function a function till 'yes' is entered by the user. You should count and sum the numbers using static variables in the function and return the average to the main function.
45. Among many integer numbers entered by the user, you have to sum 5 positive integer numbers and display the average. Draw a flowchart to address the above requirement.
46. WAP that reads two numbers from the user. If both the numbers are even then find their HCF else find their LCM. The HCF and LCM should be found using two different functions. You can, however, call one of them from other.
47. WAP to find the sum of the series $S_n = \sum 1/n^2$ up to n terms using recursion.
48. Using while loop only, WAP to print the following series until the term value is less than 750. The series is 1, 2, 5, 10, 17, 26, 37, …
49. WAP to evaluate the series until the term becomes less than 10^{-6}.

$$S_n = 1 + x/1! + x^2/2! + x^3/3! + \cdots$$

50. What do you understand by **return** statement? Explain along with example about its advantages and disadvantages.