

### 1/3 MCA First Semester

CA1L2

C PROGRAMMING AND DATA STRUCTURES LAB

Credits : 2

Lecture Hours : 4 periods / week

Internal assessment : 25 Marks  
Semester and Examination: 50 Marks

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1. **a)** Write a C program to find the sum of individual digits of a positive integer.  
**b)** A 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.  
**c)** Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
2. **a)** Write a C program to calculate the following Sum:  $\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$   
**b)** Write a C program to find the roots of a quadratic equation.
3. **a)** Write C programs that use both recursive and non-recursive functions
  - i) To find the factorial of a given integer.
  - ii) To find the GCD (greatest common divisor) of two given integers.
  - iii) To solve Towers of Hanoi problem.
4. 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)
5. **a)** Write a C program to find both the largest and smallest number in a list of integers.  
**b)** Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices
  - iii) Checking symmetricity of a square matrix.
  - iv) Calculate transpose of a matrix in-place manner.
6. **a)** Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.**b)** Write a C program to determine if the given string is a palindrome or not.
7. **a)** Write a C program that displays the position/ index in the string S where the string T begins, or -1 if S doesn't contain T.  
**b)** Write a C program to count the lines, words and characters in a given text.
8. **a)** 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.  
**b)** Write a C program to convert a Roman numeral to its decimal equivalent.
9. Write a C program that uses functions to perform the following operations using Structure:
  - i) Reading a complex number
  - ii) Writing a complex number
  - iii) Addition of two complex numbers
  - iv) Multiplication of two complex numbers
10. a) Write a C program that uses functions to perform the following operations on singly linked list. :

- i) Creation ii) Insertion iii) Deletion iv) Traversal
  - b) Adding two large integers which are represented in linked list fashion.
11. Write a C program that uses functions to perform the following operations on doubly linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
12. Write C programs that implement stack (its operations) using i) Arrays ii) linked list.
13. Write C programs that implement Queue (its operations) using i) Arrays ii) Linked List
14. Write a C program that uses Stack operations to perform the following:
  - i) Converting infix expression into postfix expression
  - ii) Evaluating the postfix expression
15. a) Write a C program that uses functions to perform the following:
  - i) Creating a Binary Tree of integers
  - ii) Traversing the above binary tree in preorder, inorder and postorder.
16. 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
17. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
  - i) Merge Sort ii) Quick sort iii) Selection Sort.
18. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
  - i) Insertion sort ii) Bubble sort iii) Shell sort