

M.Sc. 2nd Semester Examination-2021

Applied Mathematics with Oceanology and Computer programming

[Lab. 2: (Language: C Programming with Numerical Methods)]

Paper:MTM-297, Unit-2, Full Marks: 25, Time: 2 hours

Answer any one question from 1 to 10 and any one from the rest.

1. Write a program to find the sum of prime numbers and non-prime numbers separately between two input integers using function subprograms. Also print the sums in a file.
2. Write a program to find the list of prime numbers and non-prime numbers separately between two input integers using function subprograms. Also print the lists in a file.
3. Write a program to find the square difference between the first digit and the last digit of a signed integer. Also print the result in a file.
4. Write a program to rewrite a name in abbreviated form with surname first, e.g., if input is **Mrinal Kumar Ghosh** then output will be **Ghosh M. K.**
5. Write a program which takes a string as input and produce a output in a Pyramidal form, e.g., if input is RAMES output will be

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R
R A
R A M
R A M E
R A M E S
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6. Write a program which takes an integer n , and a character c as inputs and produce a Pyramidal output of height n , with the character c , e.g., if inputs are $n=5$ and $c=*$ output will be

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* *
* * *
* * * *
* * * * *
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7. Write a program in C to determine the key number from the dynamic sorted list of numbers by an appropriate technique.
8. Write a program in C to sort a dynamic list of numbers by insertion sort algorithm.
9. Write a program in C to sort a list of names in alphabetical order.
10. Write a user define-function in C that reverses a string. Hence check a string is a palindrome or not using the defined function.
11. Write a program in C to find out a correlation coefficient for a set of dynamic points (x_i, y_i) .
12. Write a program in C to determine the dominant eigenvalue of a real matrix by the power method.
13. Write a program in C to solve a initial value ODE by Milne's predictor-corrector method.

14. Write a program in C to find the solution of a Tri-diagonal system of equations.
 15. Write a program in C to interpolate a natural cubic spline interpolation.
 16. Write a program in C to solve a system of linear equations by Gauss-Seidel method.
 17. Write a program to find forward difference table for a input data set of size n using dynamic memory allocation and data set should be read from a data file.
 18. Using a bivariate input data set of size n , $(x_i, y_i), i = 1, 2, \dots, n$ find value of y for a given value of x using Lagranges Interpolation formula using dynamic memory allocation and data set should be read from a data file. Test it with a suitable example.
 19. Using a bivariate input data set (equi-spaced with respect to x) of size n , $(x_i, y_i), i = 1, 2, \dots, n$ find the value of y for a given value of x using Newton Forward Interpolation formula. Use dynamic memory allocation and data set should be read from a data file. Test it with a suitable example.
 20. Using a bivariate input data set (equi-spaced with respect to x) of size n , $(x_i, y_i), i = 1, 2, \dots, n$ find the value of y for a given value of x using Newton Backward Interpolation formula. Use dynamic memory allocation and data set should be read from a data file. Test it with a suitable example.
 21. Write a program to find the number of occurrence of a particular string in an input paragraph. Test it with suitable examples. Data should be read from a data file.
 22. Answer both the questions:
 - (a) Write a program to find roots of an equation by Iteration Method using function subprogram. Test it with a suitable example.
 - (b) Write a program to find number of vowels in an input sentence.
 23. Answer both the questions:
 - (a) Write a program to find the roots and their nature of a quadratic equation.
 - (b) Write a program to find the sum of all prime numbers between two input numbers using function subprogram.
 24. Answer both the questions:
 - (a) Write a program to solve a differential equation by fourth order Runge-Kutta method using function subprogram. Test it with a suitable example.
 - (b) Write a program to find the value of integration by Trapezoidal Rule using function subprogram. Test it with a suitable example.
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