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PG (CBCS)
M.SC Semester- II Examination, 2023
MATHEMATICS
PAPER: MTM 297
(C-PROGRAMMING WITH NUMERICAL METHODS)

Full Marks: 25 **Time: 2 Hours**

GROUP-A

1×8=08

1. Write a program in C to search a number from a dynamic sorted array of numbers by binary search technique.
2. Write a program in C to find the value of integration $\int_0^1 (x^2+1)dx$ by Gauss-Legendre quadrature formula for 6 points.
3. Write a program in C to sort an array of numbers by insertion sort algorithm.
4. Write a program in C to check a string is a palindrome or not using user defined function.
5. Write a program in C to sort a dynamic array of numbers by bubble sort technique.
6. Write a program in C to create two matrices using dynamic memory allocation and perform addition and subtraction operation among them.
7. Write a program in C to create two matrices using dynamic memory allocation and perform multiplication and transpose operations among them.
8. Write a program in C to convert the letter contains in given text file as lowercase to uppercase.
9. Write a program in C to store the records of the students in a file.
10. Write a program in C to find the value of the double integration of the function $F(x,y) = \int_0^1 \int_0^1 \left(\frac{1}{(1+x^2)(1+y^2)}\right) dxdy$ by trapezoidal rule.

GROUP-B

1×12=12

1. Write a program in C to find a real root of an equation $x^3 - 8x - 4 = 0$ by Newton-Raphson method.
2. Write a program in C to search a key number from a list of numbers by binary search technique.
3. Write a program in C to find the solutions of a Tri-diagonal system of equations
$x_1 + x_2 = 3$
$x_1 + x_2 - 3x_3 = -3$
$-2x_2 + 3x_3 = 4$
4. Write a program in C to find the value of integration $\int_1^2 (x^2+1)dx$ by Simpson-$\frac{1}{3}$'s Rule.

(P.T.O)

5. Write a program in C to find the solutions of a system of linear equations
$$-3x_1 + x_2 - 5x_3 = -12$$
$$x_1 + 2x_2 + 4x_3 = 11$$
$$x_2 + 2x_3 = 5$$
by LU decomposition method.
6. Write a program in C to find y(0.4) by solving the differential equation $\frac{dy}{dx} = x^2 - y^2, y(0) = 1$ by 4th order Runge-Kutta method using step length 0.1.
7. Write a program in C to arrange in descending order of a list of real numbers by insertion sort technique.
8. Write a program in C to find f(2) by Lagrange Interpolation Technique given that f(1)=1.500, f(3)=2.232, f(4)=2.500, f(5)=2.736 and f(6)=2.949.
9. Write a program in C to find the approximate largest Eigen value (in magnitude) and the corresponding Eigen vector of the following matrix by Power method
$$\begin{pmatrix} 2 & 3 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 1 \end{pmatrix}$$
10. Write a program in C to find y(0.4) by solving the differential equation $\frac{dy}{dx} = x - y, y(0) = 1$ by Milne's Predictor Corrector method using step length 0.05.
11. Write a program in C to arrange in ascending order of a list of real numbers by selection sort technique
12. Write a program in C to find y(1.2) by solving the differential equation $\frac{dy}{dx} = x - y, y(0) = 1$ by modified Euler method using step length 0.2.
13. Write a program in C to find the value of $\int_0^2 \frac{x}{1+x^2} dx$ by using six point Gauss-Chebyshev quadrature formulae.
14. Write a program in C to compute $y(2.9)$ using Newton's backward interpolation formula given that y(2.0)=0.3010, y(2.2)=0.3424, y(2.4)=0.3802, y(2.6)=0.4149, y(2.8)=0.4471, y(3.0)=0.4772.
15. Write a program in C to find the value of $\int_0^2 \frac{x}{1+x^2} dx$ by using six point Gauss-Legendre quadrature formulae.
16. Write a program in C to find the value of $\int_1^2 x^2 dx$ by Monte Carlo method.
17. Write a program in C to compute $y(2.1)$ using Newton's forward interpolation formula given that y(2.0)=0.3010, y(2.2)=0.3424, y(2.4)=0.3802, y(2.6)=0.4149, y(2.8)=0.4471, y(3.0)=0.4772.
18. Write a program in C to find the solutions of a system of linear equations
$$-3x_1 + x_2 - 5x_3 = -12$$
$$x_1 + 2x_2 + 4x_3 = 11$$
$$x_2 + 2x_3 = 5$$

by Gauss elimination method.

19. Write a program in C to find the solutions of a system of linear equations
$$-3x_1 + x_2 - 5x_3 = -12$$
$$x_1 + 2x_2 + 4x_3 = 11$$
$$x_2 + 2x_3 = 5$$
by Guass-Seidal method.

[Notebook & Viva:05]

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