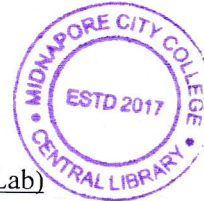


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MCA Semester- II Examination, 2025
MASTER OF COMPUTER APPLICATIONS
PAPER: MCA 206 (PRACTICAL)
(Numerical Methods and Optimization Technique Lab)



Full Marks: 100

Time: 4 Hours

The figures in the right-hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Answer **TWO** questions selecting it by lucky draw:**25×2=50**

1. Write a program in C to find a real root of an equation $x^3 - 8x - 4 = 0$ which lies between 3 and 4, by Newton-Raphson Method.
2. Write a program in C to compute the root of the equation $x^3 - 4x - 9 = 0$ correct up to 3 decimal places, using Bisection method.
3. Write a program in C to find a root of the equation $3x - \cos x - 1 = 0$, by Regula Falsi method.
4. Write a program in C to find the value of a function $f(x)$ using given tabular values by Lagrange Interpolation method. Test the program to find $f(2.18)$ using the following:

X	2	2.2	2.4	2.6	2.8	3
f(x)	0.30103	0.34242	0.38041	0.41497	0.44716	0.47721

5. Write a program in C to apply Newton's backward difference formula to obtain the value of y at $x=2.5$, using the following table

x :	0	1	2	3	4	5
y :	41	43	47	53	61	71

6. Write a program in C from the below table of half yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46 using Newton's forward formula.

Age(x)	45	50	55	60	65
Premium (y)	114.84	96.16	83.32	74.48	68.48

7. Write a program in C if $f(1.15) = 1.0723$, $f(1.20) = 1.0954$, $f(1.25) = 1.1180$, $f(1.30) = 1.1401$, find $f(1.28)$ using Newton's backward formula.

(P.T.O.)

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8. 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 second order Runge-Kutta method using step length 0.1.
9. Write a program in C to compute $y(0.03)$ where $\frac{dy}{dx} = 2x^2 + 3y$, $y(0) = 1$ by Euler's method.
10. Write a program in C to determine the value of y when $x=0.2$ given that $y(0) = 1$ and $\frac{dy}{dx} = x^2 - y$ by Modified Euler's method.
11. Write a program in C to calculate $y(2.5)$ using Runge-Kutta method of order four of the initial value problem $\frac{dy}{dx} = \cos^2 x + 2x - y^2$, $y(1) = 0$ using $h=0.1$.
12. Write a program in C to evaluate the integral by Trapezoidal rule with sub-interval $n=10$ $\int_0^{\pi} \sqrt{1 - 0.154 \sin^2 x} dx$
13. Write a program in C to evaluate $\int_0^4 (3x - 2x^2) dx$, taking 10 intervals by Simpson's 1/3 rule.
14. Write a program in C to solve following system of equation by Gauss-elimination method:
 $x + 2y + 3z = 7$
 $2x + 7y + 15z = 26$
 $3x + 15y + 41z = 26$
15. Write a program in C to solve following system of equation by Gauss Jacobi iteration method (Iteration method)
 $20x_1 + x_2 + x_3 = 23.28$
 $x_1 + 15x_2 - x_3 = 29.92$
 $2x_1 + x_2 - 20x_3 = -55.64$
16. 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-Seidel method.



(P.T.O.)

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17. Write a program in C to solve Euler's method the following differential equation for $x=1$ by taking $h=0.2$, $\frac{dy}{dx} = x + y$, $y=1$ when $x=0$ calculate up to four significant figures.
18. Write a program in C to calculate the value of $\int_0^1 \frac{x dx}{1+x}$ correct up to three significant figures taking six intervals by Simpson's one third rule.
19. Write a program in C to evaluate $f(1.1)$ from the table using Newton forward formula.

X	0	1	2	3	4	5
f(x)	0	3	8	15	24	35

20. Write a program in C to find the real root of the equation $x^3 - x - 1 = 0$ using iteration method.

Viva-voice-10

Practical Note Book-10
 Sessional Assessment-30

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