

G-9/2050
NUMERICAL ANALYSIS-604
(Semester-VI)

Time : Two Hours]

[Maximum Marks : 70

Note : Attempt any *four* questions. All questions carry equal marks.

- I. (a) Compute the middle values of the numbers $a = 4.568$ and $b = 6.762$ using the four digit arithmetic.
- (b) Find a root of the equation $e^x - x^3 = 0$ correct to four significant digits using Newton-Raphson method.
- II. (a) Use Secant method to find the real root of equation $\cos x - xe^x = 0$.
- (b) Perform two iterations of the Chebyshev method to find an approximate value of $1/7$. Take the initial approximation as $x_0 = 0.1$.
- III. (a) Solve the following equation by Gauss elimination method :
- $$x_1 - 3x_2 + x_3 = -1, 2x_1 + x_2 - 4x_3 = -1; 6x_1 - 7x_2 + 7x_3 = 7.$$
- (b) Solve the system of equations $27x_1 + 6x_2 - x_3 = 85$, $6x_1 + 15x_2 + 2x_3 = 72$, $x_1 + x_2 + 54x_3 = 110$ using Gauss-Seidal method.

- IV. Perform three iterations of the power method to find the largest eigen values (to four significant digits) of the system of equations :

$$10x_1 + 4x_2 - x_3 = 0, 4x_1 + 2x_2 + 3x_3 = 0, x_1 + 3x_2 + x_3 = 0.$$

Take initial values as $x_1 = x_2 = x_3 = 1$.

- V. (a) Use Lagrange formula, fir the polynomial $f(x)$ that takes the values as

x	0	2	3	6
$f(x)$	648	704	729	792

- (b) Prepare the divided difference table for the following data :

x	1	3	6	10	11
$f(x)$	3	31	223	1011	1343

- VI. Solve the following by Euler's modified method :

$$\frac{dy}{dx} = x + y, y(0) = 1 \text{ at } x = 0.3 \text{ with step size } 0.1.$$

- VII. (a) Evaluate $\int_0^4 e^x dx$ by Simpson's rule, given that

$$e = 2.72, e^2 = 7.39, e^3 = 20.09 \text{ and } e^4 = 54.6.$$

(b) Given the following values of $f(x)$ and $f'(x)$

x	-1	0	1
$f(x)$	1	1	3
$f'(x)$	-5	1	7

Estimate the value of $f(-0.5)$.

VIII. Apply Runge-Kutta fourth order method to find the

approximate value of y for $x = 0.2$ given that $\frac{dy}{dx} = x + y$,

and $y = 1$ where $x = 0$.

IX. Attempt all the questions :

(a) Find the absolute and absolute errors in $\sqrt{6} + \sqrt{7} + \sqrt{8}$ correct to 4 significant digits.

(b) Define Eigen value and Eigen vector of a matrix.

(c) What is the difference between the Gauss-elimination and Gauss-Seidel methods.

(d) Write Newton-cote's quadrature formula.

(e) Write the normal equation for the curve $y = a + bx$, for n points by the method of least squares.

(f) What is the difference between Simpson 1/3 and Simpson 3/8 rule.

- (g) Write the modified Euler's method for solving the ordinary differential differential equation.
 - (h) Find the iterative formula to find $\sqrt[k]{N}$.
 - (i) What is the difference between Euler's and Runge-Kutta methods for solving the differential equations.
 - (j) State the order of the convergence of the iterative method for nonlinear equation $f(x) = 0$.
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