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(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 2022 ONLY)

22PMS209

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : MAY - 2023
COURSE NAME: M.Sc.-MATHEMATICS **MAXIMUM MARKS: 50**
SEMESTER: II **TIME : 3 HOURS**

NUMERICAL ANALYSIS

SECTION-A (10 X1 =10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. K1

1. Interval halving method is also called _____.
   a) Newton's method b) Regula falsi method
   c) Bisection method d) Taylor's method.
2. The first objective of the elimination method is to change the matrix of coefficients to_____.
   a) Triangular b) upper triangular c) lower triangular d) identity
3. Error in Simpson's rule is of order _____.
   a) $O(h^4)$ b)$O(h^2)$ c) $O(h^5)$ d) $O(h^3)$
4. Runge-kutta method is a ------- method.
   a) single-step b) multi-step c) unique d) identity
5. When a boundary condition involves both u and its derivative, it is called a _____.
   a) Newmann condition b) Dirichelt condition
   c) mixed condition d) pure condition

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. K2

6. Write an algorithm for the Secant method.
7. What are the iterative methods?
8. What is meant by central difference formula?
9. Write the Multi-step methods.
10. Define an Initial-value problem.

SECTION-B (5X3=15 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K3

11. a) Write an Algorithm for Muller's method.

(OR)

b) Use Newton's method on $f(x) = x^3 + 2x^2 - x + 5$, to find a root.

12. a) Write an Algorithm for LU decomposition.

(OR)

b) Find the value of the determinant by using elementary row transformations to make it upper-triangular.

$$\begin{pmatrix} 1 & 4 & -2 & 3 \\ 2 & 2 & 0 & 4 \\ 3 & 0 & -1 & 2 \\ 1 & 2 & 2 & -3 \end{pmatrix}$$

13.a) Write an Algorithm to compute First and Second derivatives from Central-Difference formulae.

(OR)

b) Use Simpson's $\frac{1}{3}$ rule to evaluate the integral of e^{-x^2} over the interval 0.2 to 1.5, using 2, 4, 6 …subdivisions until the values converge to five decimal places.

14. a) Write short notes on Multistep method.

(OR)

b) Solve by Taylor' method : $\frac{dy}{dx} = x + y$, given y(1)=0 , and get y(1.1).

15.a) Solve by shooting method u''-$\left(1 - \frac{x}{5}\right) uu' = x,\ u(1) = 2\ , u(3) = -1.$

(OR)

b) Explain Power method by using an example.

SECTION-C (5X5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K4 & K5

16. a) Find the Quadratic factors of $x^4 - 1.1x^3 + 2.3x^2 + 0.5 + 3.3 = 0$ by Bairstow's Method of quadratic factors.

(OR)

b) Find a root between 0 and 1of $3xsinx - e^{-x} = 0$

17.a) Solve the system of Nonlinear equations using Newton's method $x^2 + y^2 = 4$; $e^x + y = 1$.

(OR)

b) Solve by Gaussian Seidel method,

$$-9x_1 + x_2 - 3x_3 = -12$$
$$x_1 - 9x_2 - 3x_3 = -2$$
$$-3x_1 + x_2 - 9x_3 = -12$$

18.a) Use Romberg Integration to find the integral of e^{-x^2} between the limits of a=0.2 and b= 1.5.Take the initial subinterval size as $h = \frac{b-a}{2}$ =0.65.

(OR)

b) Write an Algorithm to obtain an estimate of the derivative from a divided- difference table.

19.a) If $y' = 2x^2 - y,\ y(0) = -1$, by using Runge-Kutta method to find $y(2)$

(OR)

b) For the equation $\frac{dy}{dx} = y - x^2$, y(0) = 1, starting values are known : y (0.2)= 1.2186, y(0.4) = 1.4682 y(0.6) = 1.7379 Use the Milne' to find the value of y at $x = 0.8$

20.a) An insulated rod is 20 cm long and is of uniform cross-section. It has its right end held at 100^0 while its left end loses heat to the surroundings, which are at 20^0 The rod has a thermal conductivity,k, of 0.52 cal/(sec*cm*^{0}C) ,and the heat-transfer coefficient, H, is 0.073cal/sec/cm^2/^{0}C). Solve for the steady-state temperatures using the finite –difference method with eight subintervals.

(OR)

b) Find the eigenvalues and the eigenvectors of the matrix

$$A = \begin{bmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{bmatrix}$$ by Power method.

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