(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 2021 ONLY)

21PMS209

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : JULY-2022

M. Sc.-MATHEMATICS   **MAXIMUM MARKS: 70**

SEMESTER: II   **TIME : 3 HOURS**

NUMRICAL ANALYSIS

SECTION - A   **(10 X 1 = 10 MARKS)**

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS.

1. The order of convergence of Newton-Raphson method is of _____.

    a) first order   b) second order   c) third order   d) fourth order

2. The rate of convergence in Gauss-Seidel method is roughly_____ times than that of Gauss- Jocobi method

    a) three   b) two   c) four   d) equal.

3. Simpson's three-eighths rule is applicable only when n is a multiple of _____.

    a) two   b) three   c) four   d) unity.

4. The truncation error of Taylor series method is of order_____.
    a) h^2 b) h^6 c) h^n d) h^{n+1}

5. When a boundary condition involves both u and its derivative is called-----.
    a) Dirichlet condition   b) Neumann condition   c)mixed condition   d) nne.

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.

6. Which method is iterative, converges almost quadratically and can be used to obtain complex roots?

7. Write down the steps in relaxation method.

8. Describe Trapezoidal rule.

9. Write down the fourth order Runge-Kutta formula.

10. Define initial value problem.

SECTION – B   **(5 X 4 = 20 MARKS)**

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

11. a)   Find the root of the equation $y(x) = x^3 - 2x - 5 = 0$ which lies between 2 and 3 by Muller's method.

(OR)

   b)   Explain briefly Bairstow's method.

12. a) By LU-method, solve the following system;
$5x - 2y + z = 4$, $7x + y - 5z = 8$, $3x + 7y + 4z = 10$.

(OR)

b) Solve by Gauss-Seidel method:
$8x - 3y + 2z = 20$, $4x + 11y - z = 33$, $6x + 3y + 12z = 35$.

13. a) Find the gradient of the road at the middle point of the elevation above a datum line of seven points of road which are given below:

X	0	300	600	900	1200	1500	1800
Y	135	149	157	183	201	205	193

(OR)

b) Using Romberg's method, evaluate $I = \int_0^1 \frac{dx}{1+x}$ correct to three decimal places.

14. a) Compute y at x = 0.25, by Modified Euler method given by $y` = 2xy$, $y(0) = 1$.

(OR)

b) Derive Milne's Predictor Corrector formula.

15. a) Explain briefly shooting method.

(OR)

b) Solve $u'' - \left(1 - \frac{x}{5}\right)u = x$, $u(1) = 2$, $u(3) = -1$ with the finite difference method.

SECTION - C   **(4 X 10 = 40 MARKS)**

ANSWER ANY FOUR OUT OF SIX QUESTIONS.
(16ᵗʰ QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS (FROM Qn. No : 17 to 21)   **(K4 (Or) K5)**

16. By Gaussian elimination, find A^{-1}, if A= $\begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$.

17. Find a real root of the equation $x = e^{-x}$, using the Newton-Raphson method.

18. Solve the system of equations by Gauss-Jordan method.
$x + y + z + w = 2$, $2x - y + 2z - w = -5$, $3x + 2y + 3z + 4w = 7$, $x - 2y - 3z + 2w = 5$.

19. By dividing the range into ten equal parts, evaluate $\int_0^\pi sinx \, dx$ by trapezoidal method and Simson's $\frac{1}{3}$ rule.

20. Evaluate the values of y(0.1) and y(0.2) given $y'' - x(y)' + y^2 = 0$, $y(0) = 1$, $y'(0) = 0$ by using Taylor's series method.

21. Find the eigen values and the eigen vectors of matrix A where A= $\begin{pmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{pmatrix}$

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