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PG (CBCS)
M.SC Semester- II Examination, 2023
MATHEMATICS
PAPER: C-MTM 204A
(STATISTICAL AND NUMERICAL METHODS)

Full Marks: 50   **Time: 2 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.

GROUP-A
1. Answer any **FOUR** questions from the following: $4 \times 2 = 08$

     a) Find the median of 33, 86, 68, 32, 80, 48, 70, 64.
     b) Define consistent and inconsistent system of linear equations.
     c) Prove that $\Delta \equiv E - 1, E \equiv \Delta + 1$.
     d) Suppose π is approximated as 3.14 instead of 3.14156, find the absolute, relative and percentage errors.
     e) Find the position of a positive real root of $x^3 - 3x + 4 = 0$.
     f) What is degree of precision of a quadrature formula.

GROUP-B
2. Answer any **FOUR** questions from the following: $4 \times 4 = 16$

     a) Define absolute, relative and percentage errors. Find the absolute, relative and percentage errors when 2/3 is approximated to 0.667, correct up to six decimal places.   2+2
     b) Obtain Lagrange's interpolating polynomial for $f(x)$ and find an approximate value of the function $f(x)$ at $x = 0$, given that $f(-2) = -5, f(-1) = -1$ and $f(1) = 1$.   4
     c) Find the iteration schemes to solve the following equation using Newton-Raphson method (correct up to two decimal places) $x^3 - 2x - 5 = 0$.   4
     d) Solve the following differential equation $\frac{dy}{dx} = 3x^2 + y, y(0) = 0$ for $0.1 \leq x \leq 0.5$, using Euler's method by taking $h = 0.1$.   4
     e) Find a location a root of the equation $x^2 - 5x + 6 = 0$. Use Cramer's rule to solve the systems of equations $x + y + z = 2, 2x + y - z = 5, x + 3y + 2z = 5$.   4
     f) Find an iteration scheme to find the kth root of a number a.   4

GROUP-B
3. Answer any **TWO** questions from the following: $2 \times 8 = 16$

     a) Describe the bisection method to find a root of the equation $f(x) = 0$ when $f(a)f(b) < 0, a, b$ be two specified numbers. Find a root of the equation $x^2 + x - 7 = 0$ using bisection method, correct up to two decimal places.   3+5
     b) Given $\frac{dy}{dx} = x^2 + y^2$ with $x = 0, y = 1$. Find $y(0.1)$ by fourth-order Runge-Kutta method by taking $h = 0.1$.   *(P.T.O)*

c) Compute correlation co-efficient, regression co-efficient between the advertisement cost (x) and sale (y) as per data given below and also find the lines of regression.

Advertisement costs in thousand Rs. (x)	39	65	62	90	82	75	25	98	36	78
Sales in Lakhs Rs. (y)	47	53	58	86	62	68	60	91	51	84

d)   3+5

   i) Define the operators: forward difference (Δ), backward difference (∇). Also, prove that $(1 + \Delta)(1 - \nabla) \equiv 1$.

   ii) Solve the equations by Gauss elimination method.
$$2x_1 + x_2 + x_3 = 4,$$
$$x_1 - x_2 + 2x_3 = 2,$$
$$2x_1 + 2x_2 - x_3 = 3.$$

[Internal Assessment- 10 Marks]

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