

PG (NEW) CBCS
M.Sc. Semester-II Examination, 2020
MATHEMATICS
 PAPER: C-MTM 204
 STATISCAL AND NUMERICAL METHODS

Full Marks: 40**Time: 2 Hours**

1. ANSWER ANY ONE QUESTION OF THE FOLLOWING: 40X1=40
- a. Describe Newton-Raphson method to find a real root to find a real root of the equation $f(x)=0$, where $f(x)$ is a continuous function of x . Give the geometrical interpretation of the method. Write the convergence criteria of this method.
 Compute $y(0.3)$, from the equation $\frac{dy}{dx} = x - y, y(0) = 1$, taking step length $h=0.1$, by fourth order Runge-kutta method, correct upto five decimal places
- b. Describe Chi-square distribution and Student's t-distribution.
 Deduce the equation of regression lines for a set of n bivariate data. Prove that Correlation coefficient of two variables is the geometric mean of the two regression coefficient.
- c. Explain bisection method for computing a real root of an equation $f(x)=0$. Find the value of $\int_1^2 \frac{dx}{x}$ by trapezoidal rule by taking 4 equal subintervals.
 Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's 1/3 rule by taking 6 equal subintervals. If two variables x and y satisfy the relation $y=-5+6x$, find the correlation coefficient between x and y .
- d. Show that the sum of the Lagrangian function is 1. Show that the form of Lagrangian functions remain unchanged under linear transformation.
 Discuss modified euler's method. Define different types of error.
- e. Discuss the Gauss-elimination method for solving the system of linear equations.
 Discuss Regula-falsi method.
- f. Discuss the Gauss-seidal method for solving the system of linear equations.
 Discuss fixed point iteration method.
- g. Discuss the Runge-kutta method of fourth order. Discuss simpson's 1/3 rule.

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- h. Discuss the trapezoidal rule. Discuss Euler's method.
- i. Find a root of the equation $x^3 + x - 7 = 0$ by bisection method correct upto two decimal places. Solve the following differential equation $\frac{dy}{dx} = 3x^2 + y, y(0) = 4$ for the range $0.1 \leq x \leq 0.5$, using Euler's method by taking $h=0.1$.
- j. Find a root of the equation $x^3 + 2x - 2 = 0$ using Regula-falsi method, correct up to three decimal places. Given that $\frac{dy}{dx} = y^2 - x^2$, where $y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ by second-order Runge-kutta method.
- k. Find a root of the equation $\cos x - xe^x = 0$ correct up to three decimal places. State the geometrical interpretation of k_1, k_2, k_3, k_4 .
- l. Find an iteration scheme to find the kth root of a number a. Compute the determinant of the following matrix by a triangular algorithm using i) partial pivoting ii) complete pivoting:

$$\begin{bmatrix} 2 & 0 & 4 \\ 4 & 6 & 1 \\ 5 & 1 & -2 \end{bmatrix}$$
