2103000204023002
EXAMINATION APRIL 2025
BACHELOR OF SCIENCE (FOURTH SEMESTER)
MATHEMATICS PAPER-IX (MTH-402 MATHEMATICS-IX)

[**Time: As Per Schedule]** **[Max. Marks: 50]**

Instructions:
1. Fill up strictly the following details on your answer book
   a. Name of the Examination : **BACHELOR OF SCIENCE (FOURTH SEMESTER)**
   b. Name of the Subject : **MATHEMATICS PAPER-IX (MTH-402 MATHEMATICS-IX)**
   c. Subject Code No : **2103000204023002**
2. Sketch neat and labelled diagram wherever necessary.
3. Figures to the right indicate full marks of the question.
4. All questions are compulsory.
5. Use of scientific nonprogrammable calculator is allowed
6. Follow usual notations.

Seat No:

Student's Signature

Q.1 Answer any five as directed **10**

(1) State Newton's divided difference Interpolation formula.

(2) lf $f(1) = 4$, $f(3) = 12$, $f(x) = 10$, find x

(3) Construct a divided difference table for

x	1	2	4	8
$F(x)$	0	1	5	21

(4) What is difference between direct method and iterative method.

(5) Find a function taking values (2, 4) and (3, 6) using divided difference formula.

(6) If $f(x)\frac{1}{x^2}$, find the divided difference $[x_1, x_2]$

(7) Write all the subintervals of [0,3] for applying Simpson 1/3 rule with $n = 12$

(8) State the formula for finding first order derivative of a function at $x = x_n$.

Q.2 Attempt any two. **10**

(1) Derive Lagrange Interpolation formula

(2) From the following table find *y* (5) using Newton's divided difference formula.

x	**1**	**3**	**4**	**6**
y	**-3**	**9**	**30**	**132**

(3) Express $\frac{x^2-x-3}{(x^2-4)(x+3)}$ as a sum of partial fractions using Lagrange interpolation formula.

Q.3 Attempt any two. **10**

(1) Derive the formula for finding second derivative of a function at $x = x_0$

(2) Find the first derivative of the function tabulated below at *x* = 1.4

x	**1.4**	**1.6**	**1.8**	**2.0**	**2.2**
y	**4.0552**	**4.9530**	**6.0496**	**7.3891**	**9.0250**

(3) Find the second derivative of $f(x)$ at $x = 0$ from the following table

x	**0**	**1**	**2**	**3**	**4**	**5**
f(x)	**0**	**3**	**7**	**15**	**38**	**50**

Q.4 Attempt any two. **10**

(1) Derive Simpson 1/3 rule for numerical integration.

(2) Evaluate $\int_0^2 \frac{dx}{x^3+x+1} dx$ using Simpson 3/8 rule with h= 0.25

(3) Evaluate $\int_0^{0.6} \frac{1}{\sqrt{x-x^2}} dx$ by Trapezoidal rule by taking n= 6.

Q.5 Attempt any two **10**

(1) Explain Picard's method to solve the IVP
$\frac{dy}{dx} = f(x, y)$ where $y(x_0) = y_0$

(2) Use Euler method to find $y(1.1)$, $y(1.2)$ and $y(1.3)$ from the following differential equation
$\frac{dy}{dx} = x + 2y$ given $y(1) = 1$

(3) If $\frac{dy}{dx} = y^2 + x^2$ given $y\ (0) = 1$, compute $y\ (0.4)$ with $h = 0.2$ by Taylor series method.

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