RAN - 2003000204020032

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S. Y. B. Sc. (Sem. - IV) Examination April - 2023

Mathematics - IX (MTH - 402)

Time: 2 Hours] **[Total Marks: 50**

સૂચના : / Instructions

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:

☛ **S. Y. B. Sc. (Sem. - IV)**

Name of the Subject :

☛ **Mathematics - IX (MTH - 402)**

Subject Code No.: **2003000204020032**

Seat No.:

Student's Signature

(2) All questions are compulsory.
(3) Marks of each question are shown against it.
(4) Use of scientific non-programmable calculator is allowed.
(5) Follow usual notations.

Q. 1: Attempt any five as directed. **(10)**

(1) Is Lagrange Interpolation formula reversible ? Explain

(2) If length of the interval is h, $h > 0$ evaluate $[x_1, x_2, x_3]$

(3) Construct a divided difference table for

(4) State general quadrature formula.

x	–1	1	2	3
$f(x)$	–21	15	12	3

(5) Find a function taking values (–1, 2) and (3, 3) using Lagrange formula.

(6) Prove that $[x_1, x_2, x_3] = [x_3, x_2, x_1]$

(7) Write all the subintervals of [2, 14] for applying Simpson 3/8 rule with $n = 9$.

(8) State the formula for finding first and second order derivative at $x = x_0$.

Q. 2: **Attempt any two.** **(10)**

(1) Derive Lagrange interpolation formula.

(2) Apply Newton's divided difference interpolation to find a polynomial from the following table.

x	0	2	3	4	5	9
$f(x)$	4	26	58	112	194	922

(3) Express $\frac{x^2 - 3x + 1}{(x-1)(x-2)(x-3)}$ as a sum of partial fractions using Lagrange interpolation formula.

Q. 3: **Attempt any two.** **(10)**

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

(2) Find the third derivative of the function tabulated below at $x = 1.5$

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.000	13.625	24.000	38.875	59.000

(3) Find the first and second derivative of $f(x)$ at $x = 1$ from the following table

x	-2	-1	0	1	2	3	4
$f(x)$	104	17	0	-1	8	69	272

Q. 4: **Attempt any two.** **(10)**

(1) Derive Simpson 3/8 formula for numerical integration.

(2) Evaluate $\int_1^7 \frac{1}{x} dx$ using Simpson 1/3 rule by dividing whole range in to six equal parts. Hence find $log_e 7$.

(3) Evaluate $\int_{0.5}^{0.7} \sqrt{x}\, e^{-x}\, dx$ using Trapezoidal rule by dividing whole range into four equal parts.

Q. 5: Attempt any two. **(10)**

(1) Discuss Euler's method for solving a differential equation of first order $\frac{dy}{dx} = f(x, y)$, given $y = y_0$ when $x = x_0$.

(2) Solve $\frac{dy}{dx} = 2y + 3e^x$, $x = 0 = y$ using Taylor series method to obtain $y(0.2)$ taking $h = 0.1$.

(3) Use Picard's method to find $y(0.2)$ from $\frac{dy}{dx} = x - y$, given $y = 1$ when $x = 0$

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