



RAN-7026

B. Sc. Sem-IV Examination

March / April - 2019

Mathematics - MTH - 403

Numerical Analysis-II

(Old Course)

(Old or New to be mentioned where necessary)

[Total Marks: 50

સૂચના : / Instructions

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

Name of the Examination:

B. Sc. Sem-IV

Name of the Subject :

Mathematics - MTH - 403 (Numerical Analysis-II)

Subject Code No.: 7 0 2 6

Seat No.:

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Student's Signature

- (1) All questions are compulsory.
- (2) Follow usual notations.
- (3) Figures to the right indicate total marks of the question.
- (4) Use of Scientific non-programmable calculator is allowed.
- (5) Total marks 50.

Que:1 Answer any FIVE as directed.

[10]

- (1) Use divided difference interpolation formula to obtain the function $f(x)$ for the given data (1,9) and (0,5).
- (2) If $y(x) = \frac{1}{x^3}$, then find the value of $[a, b]$.
- (3) Prove that $[x_1, x_2] = [x_2, x_1]$.
- (4) Write the Lagrange's formula for unequally spaced values of argument.
- (5) Construct the divided difference table for the following data:

$x:$	0	2	3	5
$y:$	0	1	5	11

- (6) Write the formula to find the first and second derivatives at the point $x = x_0$.
- (7) Write all the subintervals of $[10,16]$ for applying Simpson's $\frac{1}{3}$ Rule, taking $h = 0.5$
- (8) Define : Initial Value Problem

Que:2 Attempt any TWO. [10]

- (1) Derive Newton's Divided Difference Interpolation Formula.
- (2) Use Lagrange's Interpolation formula to obtain the value of $y(1)$:

$x:$	0	4	5	7
$y(x):$	7.71	8.29	8.43	8.71

- (3) Express the rational function $f(x) = \frac{3x^2 + x + 1}{x^3 - 6x^2 + 11x - 6}$ as a sum of partial fraction.

Que:3 Attempt any TWO. [10]

- (1) Derive the formula to find the first order differentiation at the point $x = x_n$.
- (2) From the following table of values, obtain $\left[\frac{d^2y}{dx^2} \right]_{x=0.4}$:

$x:$	0.1	0.2	0.3	0.4	0.5
$y:$	1.5	5	11.5	20	32

- (3) The following table of values x and y is given, find the value of the second derivative when $x = 0.5$:

$x:$	1.1	1.2	1.3	1.4	1.5
$y:$	0.3	0.7	1.25	1.32	1.55

Que:4 Attempt any TWO. [10]

- (1) Derive the Simpson's $\frac{3}{8}$ rule.
- (2) Use Trapezoidal rule to find the integral

$$I = \int_0^1 \frac{1}{1+x^2} dx; \text{ where } h=0.125$$
- (3) Apply Simpson's $\frac{1}{3}$ rule to obtain the value of the integral

$$\int_0^2 \frac{1}{\sqrt{x} \sqrt{1-x}} dx; \text{ where } h = 0.25$$

Que:5 **Attempt any TWO.**

[10]

- (1) Explain Taylor's series method to solve the initial value problem $\frac{dy}{dx} = f(x, y)$, where $y(x_0) = y_0$.
 - (2) If $\frac{dy}{dx} = 1 + xy$, $y(0) = 1$, compute the value of $y(2)$, $y(3)$ and $y(4)$ using Euler's method. (Where $h = 0.5$)
 - (3) Consider the initial value problem $\frac{dy}{dx} = y + x^2$; $y(0) = 1$, use Picard's method to obtain $y(0.5)$ and $y(1.0)$.
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