

**Kathmandu University**  
Second In-Semester Exam-2025  
**Department of Artificial Intelligence**

Level: B.Tech Artificial Intelligence

Course: AIMA 203

Year: II

Semester: II

Time: 60 minutes

F.M. : 20

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**Writing:** Do any two. ( $5marks \times 2$ )

1. Find an estimate of  $y(2.5)$  using the natural cubic splines from the data points:  
 $(0, 1), (1, 2), (2, 33), (3, 244)$ .
2. Fit a function of the form  $y = ax^b$  to the data points:  
 $(61, 350), (26, 400), (7, 500), (2.6, 600)$
3. Find by Taylor's series method the value of  $y(0.1)$  given that  $\frac{dy}{dx} = 1 + xy$ ,  $y(0) = 1$   
correct up to four decimal places.
4. The distance traversed by a particle at different times are given below. Find the  
acceleration of the particle at  $t = 0.1$  seconds.

t	0.0	0.1	0.2	0.3
x	3.01	3.16	3.29	3.36

**Lab:** Attempt questions that add up to 5 marks.

1. Using Trapezoidal rule evaluate the double integral

$$\int_2^2 \int_0^4 y \tan x \, dx \, dy.$$

taking  $n = 4$ . [5]

2. Use Modified Euler's method to find  $y(1)$  using  $n = 5$  for  $y' = \frac{y^2 - x^2}{y^2 + x^2}$ ,  $y(0) = 1$ . [3]
3. Using Bisection method,  $x^3 - x - 1 = 0$ . [2]
4. Using Newton-Rapshon method,  $x^2 + 4\sin x = 0$ . [2]
5. Solve the using Newton-Rapshon's method.  $3yx^2 - 10x + 7 = 0$  and  $y^2 - 5y + 4 = 0$   
starting  $(0,0)$  doing 4 iterations. [4]
6. Use Modified Euler's method to find  $y(1.4)$  using  $n = 5$  for  $y' = \frac{3x + y}{x + 2y}$ ,  $y(1) = 1$ .  
[4]

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Name:	Roll No:	Marks-Scored:
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[10 Q  $\times$  1 = 10 marks] (*Do any five*).

Fill in the blanks by writing the most appropriate word(s) or symbol(s).

1. Write the condition for the natural quadratic spline. \_\_\_\_\_.
2. What is the difference between python list and numpy array?  
\_\_\_\_\_.
3. Write a major drawback of linear splines. \_\_\_\_\_.
4. Why is cubic spline the most popular one? \_\_\_\_\_  
\_\_\_\_\_.
5. What are  $m_i$ 's and  $M_i$ 's in the quadratic and cubic splines? \_\_\_\_\_.
6. Write the formula for Romberg's Integration using Trapezoidal rule. \_\_\_\_\_.
7. From where the  $u_i$ 's are obtained in Gaussian quadrature. \_\_\_\_\_.
8. Write an second-degree IVP. \_\_\_\_\_.