Roll No…….. **Total No. of Printed Pages: [01]**
Total No. of Questions: [09]

B.Sc. (Hons.) Math (Semester – 4th)
NUMERICAL METHODS
Subject Code: BMATS1423
Paper ID: [22131217]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. What is the meaning of quadratic convergence of a method?
b. When Newton-Raphson method fails?
c. Define interpolation.
d. Evaluate $\frac{\Delta^2}{E} Sinx$ taking h as interval of differences.
e. Prove that $\nabla = 1 - e^{-h\Delta}$
f. Write the formula of Boole's and Weddle's rule of integration.
g. What is Gaussion integration?
h. Evaluate y(1), given that $\frac{dy}{dx} = y + x; y(0) =. 5$ by Euler's method
i. Evaluate y(2), gven that $\frac{dy}{dx} = y + x; y(0) = 1$ by Picard's method.
j. Write the predictor-corrector formula of Adams-Bashforth.

Section – B **(5 marks each)**

Q2. Evaluate $\int_0^6 \frac{dx}{x^3+x+1}$ using Simpson's 1/3rd rule taking step size 0.25.

Q3. Find $y'(0)$ and $y''(0)$ from the table

x:	0	1	2	3	4
y:	4	8	15	7	6

Q4. Derive Newton's forward interpolations formula.

Q5. Apply Bessel's formula to obtain y_{25} ; given that $y_{20} = 2854$, $y_{24} = 3162$, $y_{28} = 3544$, $y_{32} = 3992$

Q6. Use factorization method to solve

$$2x + 2y + 10z = 14;$$

$$2x + 10y + z = 13;$$

$$10x + y + z = 12$$

Section – C **(10 marks each)**

Q7. a. Using regula-falsi method, find real root (correct to 3 decimal) places of $x^3 - 3x + 1 = 0$

b. Apply Gauss Jordan method to solve $3x - y - z = 4$, $x + 4y - z = -5$, $x + y - 6z = -12$

Q8. Using Runge-Kutta method of order 4, find y for x = 0-1, 0.2, 0.3, given that $dy/dx = xy + y^2$; y(0) = 1. Continue the solution at x = 0.4 using Milne's method.

Q9. a. Use modified Euler's method to find y(0.2) given that $dy/dx = y + e^x$; y(0) = 0

b. If y(5) = 12, y(6) = 13, y(9) = 14, y(11) = 16, Find y(10) using Legrange's method of interpolation.