

CS/BCA/EVEN/SEM-4/BM-401/2015-16

Maulana Abul Kalam Azad University
of Technology, West Bengal



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : BM-401

**STATISTICS, NUMERICAL METHODS AND
ALGORITHM**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own
words as far as practicable.*

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following : $10 \times 1 = 10$

- i) $(I + \Delta)(I - \nabla)$ is equal to
 - a) 1
 - b) Δ^2
 - c) ∇^2
 - d) none of these.
- ii) Lagrange's interpolation formula is used for
 - a) equally spaced arguments
 - b) unequally spaced arguments
 - c) unequally or equally spaced arguments
 - d) none of these.

CS/BCA/EVEN/SEM-4/BM-401/2015-16

- iii) The number of significant digits in 1.00234 is
- a) 3 b) 4
c) 5 d) 6.
- iv) First order forward difference of a constant function
is
- a) 0 b) 1
c) 3 d) 4.
- v) Newton-Raphson method can be used to solve the
equation $f(x) = 0$ when
- a) $f'(x) > 0$ b) $f'(x) < 0$
c) $f'(x) = 0$ d) none of these.
- vi) Trapezoidal rule will not produce any error if $f(x)$ is
- a) Parabolic b) Linear
c) Logarithmic d) None of these.
- vii) Which of the following methods is an iterative
method ?
- a) Gauss Elimination Method
b) Gauss-Jordan Method
c) Gauss-Jacobi Method
d) Crout's Method.

CS/BCA/EVEN/SEM-4/BM-401/2015-16

viii) The error in Runge-Kutta method of 4th order is

- a) $O(h^2)$
- b) $O(h^3)$
- c) $O(h^4)$
- d) $O(h^5)$.

ix) If the n th order forward difference of a polynomial is 0, then the degree of the polynomial will be

- a) n
- b) $(n - 1)$
- c) $(n + 1)$
- d) None of these.

x) Regula-Falsi method is

- a) conditionally convergent
- b) linearly convergent
- c) divergent
- d) none of these.

xi) Modified Euler's method has a truncation error of the order of

- a) h
- b) h^2
- c) h^3
- d) h^4 .

xii) The rate of convergence of secant method is

- a) 2
- b) 1
- c) 0.62
- d) 1.62
- e) None of these.

GROUP - B

(Short Answer Type Questions)

Answer any three of the following. $3 \times 5 = 15$

2. Solve the following equations using Gauss-Seidel

Method :

$3x + y + 5z = 13$, $5x - 2y + z = 4$, $x + 6y - 2z = -1$ continue up to 3 successive approximation.

3. Find $f(5)$ using Newton's divide difference formula, for the following data :

X	0	2	3	4	7	.8
$f(x)$	4	26	58	112	466	668

4. Find a negative root of the equation $x^3 - 3x - 5 = 0$ using Bisection method correct up to three decimal places.

5. Evaluate $\int_1^3 \frac{x dx}{x^2 + 3}$ by Simpson's $\frac{1}{3}$ rule taking 7 ordinates and find the value of $\log_e \sqrt{3}$.

6. Using Taylor's series method find $y(0.2)$ correct up to three decimal places from $\frac{dy}{dx} = 2x + 3y^2$ given $y(0) = 0$ taking $h = 0.1$.

CS/BCA/EVEN/SEM-4/BM-401/2015-16

GROUP - C

(Long Answer Type Questions)

Answer any three of the following. $3 \times 15 = 45$

7. a) Apply Lagrange's interpolation formula to find $f(x)$ if $f(1) = 2, f(2) = 4, f(3) = 8, f(4) = 16$ and $f(7) = 128.$
- b) Solve the equation $x^3 - 3x - 5 = 0$ within (1, 2) by Bisection method correct to three decimal places.
- c) Deduce Newton's Backward Interpolation formula.

5 + 5 + 5

8. a) Solve by Euler's method the following differential equation $\frac{dy}{dx} = x^2 - y, y(0) = 1$, for $x = 0.3$ taking $h = 0.1$, correct up to four decimal places. 8
- b) Use Regula-Falsi method to evaluate the smallest real root of the equation $3x - \cos x - 1 = 0$, correct to three decimal places. 7

9. a) Solve the following system of equations by LU Factorization method. 6

$$2x - 3y + 4z = 8$$

$$x + y + 4z = 15$$

$$3x + 4y - z = 8$$

CS/BCA/EVEN/SEM-4/BM-401/2015-16

- b) Obtain the order of convergence of Newton-Raphson method. 4
- c) Solve the following system of equations by Gauss-Jacobi iteration method correct up to 3 significant figures. 5

$$20x + 5y - 2z = 14$$

$$3x + 10y + z = 17$$

$$x - 4y + 10z = 23$$

10. a) Use Runge-Kutta method of order 2 to calculate $y(0.1)$ for the equation correct up to 4 decimal places. 4

$$\frac{dy}{dx} = x + y^2, \quad y(0) = 1$$

- b) Given $\frac{dy}{dx} = x^2 + y^2$, $y(1) = 2.3$, calculate $y(1.1)$ by modified Taylor Series method correct up to 4 decimal places. 6
- c) Find a real root of the equation $x = 2x - 3$ correct up to 3 decimal places by iteration method. 5

11. a) Solve the system of eqation by Gauss elimination method : 7

$$x + 3y + 2z = 5$$

$$2x - y + z = -1$$

$$x + 2y + 3z = 2$$

CS/BCA/EVEN/SEM-4/BM-401/2015-16

- b) The following table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface :

Height (x)	100	150	200	250	300	350	400
Distance (y) :	10.66	13.06	15.07	16.84	18.45	19.93	21.3

Find the value of y when $x = 120$ ft and $x = 390$ ft. 8
