



HALDIA INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION UNDER MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL)

Paper Code: OEC-CS 601A

Paper Name: Numerical Methods

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)

Choose the correct alternatives from the followings:

15 x 1 = 15

1. (i) After rounding off to 3 significant figure, the number 4.0095 becomes [CO-2]

- a) 4.009 b) 4.0095 c) 4.00 d) 4.01

(ii) Which relation is true [CO-2]

- a) $E = 1 - \Delta$ b) $E = 1 + \Delta$ c) $\Delta = 1 + E$ d) $\nabla = E$

(iii) $\Delta\left(\frac{1}{x}\right)$ is equals to [CO-3]

- a) $\frac{1}{x(x+h)}$ b) $\frac{1}{x+h}$ c) $-\frac{h}{x(x+h)}$ d) $\frac{h}{x(x+h)}$

(iv) The truncation error in composite Simpson's 1/3rd rule is of order [CO-2]

- a) h^2 b) h^3 c) h^4 d) h^5

(v) In Trapezoidal rule for finding $\int_a^b f(x)dx$, $f(x)$ is approximated by [CO-3]

- a) line segment b) parabola c) circle d) ellipse

(vi) The degree of precision of Simpson's 1/3rd rule is [CO-2]

- a) 1 b) 2 c) 3 d) 5

(vii) Inverse of a matrix A is given by [CO-3]

- a) $\frac{Adj(A)}{|A|}$ b) $\frac{|A|}{Adj(A)}$ c) $\frac{Adj(A)}{A}$ d) $\frac{Adj(A)}{A|A|}$

(viii) The system of linear equations $x + y = 2, 2x + 6y = 8$ has [CO-4]

- a) equal solution b) no solution c) many solution d) none of these

(ix) The Gauss elimination method fails when any one of the pivotal elements is [CO-4]

- a) zero b) one c) two d) none

(x) One of the roots of $x^2 + 5x - 3 = 0$ lies between [CO-3]

- a) 1 and 2 b) 0 and 1 c) 2 and 3 d) -1 and 0

(xi) The Newton-Raphson's method fails when [CO-2]

- a) $f'(x) = 1$ b) $f'(x) = 0$ c) $f'(x) = -1$ d) $f''(x) = 0$

(xii) If $\frac{dy}{dx} = x + y, y(1) = 0$ then the value of $y(1.1)$ is by Euler's method is [CO-3]

- a) 0.1 b) 0.2 c) 0.3 d) 0.4

(xiii) If $\frac{dy}{dx} = 1 + xy$, $y(1) = 1$ then the value of $y(1.1)$ is by Euler's method is [CO-4]

- a) 1.1 b) 1.2 c) 1.3 d) 1.4

(xiv) Error involved in 2nd order R-K method is [CO-3]

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

(xv) If $\frac{dy}{dx} = 1 + xy$, $y(1) = 0$ then the value of k_1 in R-K method for $h = 0.1$ is [CO-4]

- a) 0.2 b) 0.3 c) 0.1 d) 0.4

Group – B

(Short Answer Type Questions)

Attempt any three from the followings:

3 x 5 = 15

2. Evaluate $f(1)$ if $f(0) = 2, f(2) = 6, f(4) = 10, f(6) = 15$ [CO-2]

3. Integrate numerically $\int_0^4 x^2 dx$ by Simpson's 1/3rd rule with 4 sub-intervals. [CO-3]

4. Solve $x + 3y = 5$; $7x + 2y = -3$ by Gauss-Seidel method. [CO-4]

5. Find the root of $x^3 - 9x + 1 = 0$ in $[2,3]$ by Newton-Raphson's method. [CO-4]

6. Find the value of $y(1.1)$ by Euler's Modified method, from the IVP

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}, y(1) = 1, \text{ taking } h = 0.1. \text{ [CO-5]}$$

Group – C

(Long Answer Type Questions)

Attempt any four from the followings:

4 x 10 = 40

7. Find the value of $\sqrt{3}$, if it is given that

$$\sqrt{2.1} = 1.45, \sqrt{2.3} = 1.52, \sqrt{2.5} = 1.58, \sqrt{2.7} = 1.64, \sqrt{2.9} = 1.7, \sqrt{3.1} = 1.76. \text{ [CO-4]}$$

8. Compute the value of ' π ' from the relation $\frac{\pi}{4} = \int_0^1 \frac{dx}{1+x^2}$, taking 9 equal sub-intervals. [CO-5]

9. Solve $x + y - z = 2$; $2x + 3y + 5z = -3$; $3x + 2y - 3z = 6$ by LU factorization method. [CO-4]

10. Find the positive root of $x^3 - x^2 - 1 = 0$ by Bisection method. [CO-3]

11. Use Regular Falsi method to evaluate the smallest real root of the equation $xe^x = \cos x$. [CO-4]

12. Find the value of $y(0.4)$ using Runge-Kutta method of forth order with $h = 0.2$, given that $\frac{dy}{dx} = \sqrt{x^2 + y}$, $y(0) = 0.8$, correct up-to 2-decimal places. [CO-4]