QUESTION 2016

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following:

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

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-Jordon Method

✓c) Gauss-Jacobi Method d) Crout's Method

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

a) $0(h^2)$ b) $0(h^3)$ c) $0(h^4)$ ✓d) $0(h^5)$

ix) If the nth 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

Group – B
(Short Answer Type Questions)

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.

See Topic: ALGERAIC & TRANSCENDENTAL EQUATION, Short Answer Type Question No. 23.

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

See Topic: INTERPOLATION, Long Answer Type Question No. 10.

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

See Topic: ALGERAIC & TRANSCENDENTAL EQUATION, Short Answer Type Question No. 24.

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

See Topic: NUMERICAL INTEGRATION, Long Answer Type Question No. 2.

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 $h=0.1$.

See Topic: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION, Short Answer Type Question No. 13.

Group – C
(Long Answer Type Questions)

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.

a) See Topic: INTERPOLATION, Long Answer Type Question No. 17.a).

b) Question is wrongly stated.

c) See Topic: INTERPOLATION, Long Answer Type Question No. 17.b).

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.

b) Using Regula-Falsi method to evaluate the smallest real root of the equation $3x - \cos x - 1 = 0$, correct to three decimal places.

a) See Topic: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION, Long Answer Type Question No. 14.a).

b) See Topic: ALGERAIC & TRANSCENDENTAL EQUATION, Long Answer Type Question No. 1.a).

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

$$2x - 3y + 4z = 8$$
$$x + y + 4z = 15$$
$$3x + 4y - z = 8$$

b) Obtain the order of convergence of Newton-Raphson method.

c) Solve the following system of equations by Gauss-Jacobi iteration method correct up to 3 significant figures.

$$20x + 5y - 2z = 14$$
$$3x + 10y + z = 17$$
$$x - 4y + 10z = 23$$

a) See Topic: ALGEBRAIC & TRANSCEDENTAL EQUATION, Long Answer Type Question No. 21.a).

b) See Topic: ALGEBRAIC & TRANSCEDENTAL EQUATION, Long Answer Type Question No. 21.b).

c) See Topic: ALGEBRAIC & TRANSCEDENTAL EQUATION, Long Answer Type Question No. 21.c).

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

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

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.

c) Find a real root of the equation $x = 2x - 3$ correct up to 3 decimal places by iteration method.

a) See Topic: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION, Long Answer Type Question No. 14.b).

b) See Topic: NEMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION, Long Answer Type question No. 5.

c) See Topic: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION, Long Answer Type Question No. 1.b).

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

$x+3y+2z=5$

$2x-y+z=-1$

$x+2y+3z=2$

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 $x=390\,ft$.

a) See Topic: ALGEBRAIC & TRANSCEDENTAL EQUATION, Long Answer Type Question No. 16.b).

b) See Topic: INTERPOLATION, Long Answer Type Question No. 15.b).