NA - 323 - 2017 - 01

B.Sc (HONS) IN CSE, PART-III, SIXTH SEMESTER EXAMINATION, 2017

CSE-323

Examination Code : 616

(Numerical Analysis)

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any **four** *questions.]*

Marks

1. (a) What do you understand by interpolation and extrapolation? Derive Newton's general interpolation formula for unequal intervals $y = f(x)$. 2+6=8

   (b) Find the polynomial satisfying the relation $y = f(x)$ by $(-1, 9)$, $(0, 5)$, $(2, 3)$ $(5, 15)$. Calculate the degree of the polynomial directly from the difference table. Also find $f(3)$. 6

   (c) Prove that the value of any difference is independent of the order of the argument. 6

2. (a) Define algebraic and transcendental equation. Explain Newton-Raphson's process for finding the roots of the equation $f(x) = 0$. 3+5=8

   (b) By using Newton-Raphson method, find the root of $x^4 - x - 10 = 0$. Which is nearer to $x = 2$, correct to three places of decimals. 6

   (c) Show that the square root of $N = AB$ is given by $\sqrt{N} = \frac{S}{4} + \frac{IV}{S}$, where $S = A + B$. 6

3. (a) Define numerical integration. Derive Simpson's '$\frac{1}{3}$' and Weddle's rules for numerical integration. 2+6=8

   (b) Find the value of $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's '$\frac{1}{3}$' and '$\frac{3}{8}$' rules. Hence obtain the value of π in each case. 6

   (c) Prove that $C_k^n = C_{n-k}^n$. 6

Marks

4. *(a)* What is the order of a differential equation? Derive the Runge-Kutta method to solve an ordinary differential equation. 2+6=8

(b) Use Range-Kutta method to approximate y, when $x = 0{\cdot}1$ and $x = 0{\cdot}2$, given that $x = 0$, when $y = 1$ and $\left(\dfrac{dy}{dx}\right) = x + y$. 6

(c) Discuss Picard's successive approximation method. 6

5. *(a)* Describe the method of factorization to solve the system of linear equation $AX = B$. 6

(b) Solve the following system of linear equation by Gauss–Seidal method : 6

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110.$$

(c) Define eigen value and eigen vector. Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{bmatrix}$ 8

6 *(a)* Define curve fitting. Derive least square curve fitting method. 7

(b) Fit a second degree curve to the following data taking x as the independent variable: 5

x :	1	2	3	4	5	6	7	8	9
y:	2	6	7	8	10	11	11	10	9

(c) Define different types of error. 3

(d) Fit a straight line to the following data regarding x as the independent variable : 5

x :	0	1	2	3	4
y:	1	1·8	3·3	4·5	6·3

NA - 323 - 2016 - 01

B.Sc (HONS.) IN CSE, PART-III, SIXTH SEMESTER EXAMINATION, 2016

CSE-323

(Numerical Analysis)

Examination Code : 616

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any **four** *questions.]*

Marks

1. *(a)* What do you understand by interpolation and extrapolation? Derive Newton's backward interpolation formula for equal intervals for $y = f(x)$. 2+6=8

   (b) Consider the following data satisfying the relation $y = f(x)$:— 6

x :	0	1	2	3	4	5
y :	3	2	7	24	59	118

   Find the degree of $f(x)$ directly from the difference table. Also find $f(x)$ and $f(1{\cdot}5)$.

   (c) Prove that the n-th divided differences of a polynomial of the n-th degree are constant. 6

2. *(a)* Define algebraic and transcendental equation. Derive the iterative method to solve the equation $f(x) = 0$. 3+5=8

   (b) Find the real root of the equation $2x = \cos x + 3$ correct up to four places of decimal by using iterative method. 7

   (c) Derive Bisection method. 5

3. *(a)* Derive general integration formula to compute $\int_a^b f(x)\,dx$, then discuss Trapezoidal rule and Simpson's $\frac{'1'}{3}$ rule. 8

   (b) Evaluate the value of the integral $\int_2^{2\cdot4} (\sin x - \log_e x + e^x)\,dx$ by *(i)* Simpson's $\frac{(1)}{3}$ rule; *(ii)* Simpson's $\frac{(3)}{8}$ rule. 6

   (c) Show that; $\Delta^3_{bcd}\left(\frac{1}{a}\right) = -\frac{1}{abcd}$. 6

Marks

4. (a) What is the order and degree of an ODE. Deduce the Euler's method to solve and ODE. 2+5=7

(b) Approximate y and z by using Picard's method for the particular solution of $\frac{dy}{dx} = x + z$, $\frac{dz}{dx} = x - y^2$, given that $y = 2$, $x = 1$ when $x = 0$. 7

(c) Discuss 'Jacobi' iteration method for solving the system of linear equations. 6

5. (a) Describe Gaussian elimination method for the system of linear equations. 6

(b) Solve the equations 6

$$2x + 3y + z = 9$$
$$x + 2y + 3z = 6$$
$$3x + y + 2z = 8$$

by the factorization method.

(c) Define eigen value and eigen vector. Find the eigen values and eigen vectors of the matrix : $A = \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \\ -1 & 1 & 2 \end{bmatrix}$. 8

6. (a) Define curve fitting. Derive least square curve fitting method. 1+6=7

(b) Use the method of least squares to fit the straight line $y = a + bx$ to the data :— 6

x :	1	2	3	4	5
y :	3	4	5	6	8

(c) Write in short about different types of error. 4

(d) Find the relative error of the number 438·21 correct up to five significant figures. 3

NA - 323 - 2015 - 01

B.Sc (HONS) IN CSE, PART-III, SIXTH SEMESTER EXAMINATION, 2015

CSE-323

Examination Code : 616

(Numerical Analysis)

Time—3 hours

Full marks—80

[*N.B.—The figures in the right margin indicate full marks. Answer any* **four** *questions.*]

Marks

1. *(a)* Define interpolation and extrapolation. Derive Newton's general interpolation formula for unequal intervals for $y = f(x)$. 2+6=8

   (b) Find the polynomial of the lowest possible degree which assume the values 3, 12, 15, −21 when x has the values 3, 2, 1, −1 respectively and also find the value of y when $x = 4$. 6

   (c) Prove that the value of any difference is independent of the order of the argument. 6

2. *(a)* Explain Newton-Rapson's method for finding the roots of the equation $f(x)=0$. 6

   (b) Find the real root of the equation $x^2 + 4 \sin x = 0$ correct up to four places of decimals by using N-R method. 6

   (c) Find a real root of equation $f(x) = x^3 + x^2 - 1 = 0$ using iteration method. 6

   (d) Define different types of error. 2

3. *(a)* Derive Simpson's '$\frac{1}{3}$' and Weddle's rules for numerical integration. 6

   (b) Define numerical integration. Find $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's '$\frac{1}{3}$' and '$\frac{3}{8}$' rule. Hence obtain the approximate value of π in each case. 2+6=8

   (c) Establish Cote's formula. 6

4. (a) Derive the Runge–Kutta method to solve an ordinary differential equation. 6

(b) Use Picard's method to approximate y, when $x = 0{\cdot}2$, given that $y = 1$, when $x = 0$ and $\frac{dy}{dx} = x - y$. 7

(c) Given $\frac{dy}{dx} = \frac{y - x}{y + x}$, with $y = 1$ for $x = 0$. Find y approximate for $x = 0{\cdot}1$ by Euler's method. 7

5. (a) Describe any iterative method to solve the system of linear equation $AX = B$. 6

(b) Solve the following system of linear equations by Gauss-Seidel method:— 6

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110.$$

(c) Define eigen value and eigen vector. Find the eigen values and corresponding eigen vectors of the matrix:— 8

$$A = \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \\ -1 & 1 & 2 \end{bmatrix}.$$

6. (a) Define curve fitting. Derive least square curve fitting method. 1+6=7

(b) Fit a straight line to the following data regarding x as the independent variable :— 6

x:	1	2	3	4	5
y:	2	7	9	10	11

(c) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ fits the following data: 7

x	2	4	6	8	10
y	4·077	11·084	30·128	81·897	222·62

NA - 323 - 2014 - 01

B.Sc (HONS.) IN CSE, PART-III, SIXTH SEMESTER EXAMINATION, 2014

CSE-323

(Numerical Analysis)

Examination Code : 616

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any **four** *questions.]*

Marks

1. *(a)* What do you mean by divided difference? Derive Newton's backward interpolation formula for equal intervals for $y = f(x)$ — 2+5=7

   (b) Given data values are $(-1, 9)$, $(0, 5)$, $(2, 3)$, $(5, 15)$ satisfying the relation $y = f(x)$. Find the degree of the polynomial directly from the difference table. Also find $f(x)$ and $f(3)$. — 6

   (c) What are the differences between forward and backward differences? — 3

   (d) Show that, $\underset{yz}{\overset{3}{\Delta}} x^3 = x + y + z$. — 4

2. *(a)* Derive general integration formula to compute $\int_a^b f(x)\,dx$ and then discuss Trapezoidal rule. — 2+6=8

   (b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Trapezoidal and Simpson's $^1/_8$ rule. — 6

   (c) Show that the square root of $N = AB$ is given by $\sqrt{N} = \frac{S}{4} + \frac{N}{S}$, where $S = A + B$. — 6

3. *(a)* Describe the method of factorization to solve the system of linear equation $AX = B$. — 6

   (b) Solve he following system of linear equation by Gauss-Seidel Method :— — 6

   $10x - 5y - 2z = 3$

   $4x - 10y + 3z = -3$

   $x + 6y + 10z = -3.$

Marks

(c) Define eigenvalue and eigenvector. Find the eigenvalues and eigenvectors of the matrix 8

$$A=\begin{bmatrix}1 & 2 & 3\\ 0 & -4 & 2\\ 0 & 0 & 7\end{bmatrix}.$$

4. (a) What is IVP and BVP? Discuss Picard's successive approximation method. 2+5=7

(b) Approximate y and z by using Picard's method for the particular solution of $\frac{dy}{dx}=x+z$, $\frac{dz}{dx}=x-y^2$, given that $y=2$, $z=1$ when $x=0$. 8

(c) Which method gives more accurate results from Euler's method and Modified Euler's method and why? 5

5. (a) Define curve fitting. Derive least square curve fitting method. 8

(b) Fit a second degree parabola to the following data : 7

x :	0	1	2	3	4
y :	1	5	10	22	38

(c) Prove that, $C_k^n = C_{n-k}^n$. 5

6. (a) Compute y (0·2) by Runge-Kutta method of 4th order for the differential equation $\frac{dy}{dx}=xy+y^2$, $y(0)=1$. 6

(b) Use Picard's method to solve $\frac{dy}{dx}=3x+y^2$ with $x=0$, $y=1$. 8

(c) A river is 80 feet wide. The depth d (in feet) of the river at a distance x from one bank is given by the following table :— 6

x :	0	10	20	30	40	50	60	70	80
d :	0	4	7	9	12	15	14	8	3

Find approximately the area of the cross-section of the river using Trapezoidal rule and Simpson's $1/3$ rule.

NA - 323 - 2013 - 01

B.Sc (HONS.) IN CSE PART-III, SIXTH SEMESTER EXAMINATION, 2013

CSE-323

Examination Code : 616

(Numerical Analysis)

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any **four** *questions.]*

Marks

1. (a) What do you mean by interpolation and extrapolation? Derive Newton's general interpolation formula for unequal intervals for $y = f(x)$. 2+6=8

(b) Given the set of data points satisfying the relation $y = f(x)$:— 6

x :	-1	0	3	6	7
y :	3	-6	39	822	1611

Find the degree of $f(x)$ directly from the difference table. Also find $f(x)$ and $f(2 \cdot 5)$.

(c) Show that $\underset{bcd}{\Delta^3}\left(\frac{1}{a}\right) = -\frac{1}{abcd}$. 6

2. (a) Define algebraic and transcendental equation. Describe Bisection method to solve $f(x) = 0$. 2+4=6

(b) Find the real root of the equation $x^2 + 4\sin x = 0$ correct upto four places of decimals by using $N - R$ method. 6

(c) Show that the Newton-Raphson's iterative formula for $\frac{1}{N}$ is given by $x_{n+1} = x_n (2 - Nx_n)$. 4

(d) What are the merits and demerits of $N - R$ method? 4

NA - 323 - 2013 - 02

Marks

3. (a) Define eigenvalue and eigenvector. 2

(b) Find the eigenvalues and eigenvectors of the metric : 6

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}.$$

(c) Derive the Euler's method to solve an *ODE*. 6

(d) Using Euler's modified method, find a solution of the equation $\frac{dy}{dx} = x + |\sqrt{y}| = f(x, y)$ with initial condition $y = 1$ at $x = 0$ for the range $0 \le x \le 0{\cdot}6$ in steps of $0{\cdot}2$. 6

4. (a) Explain Gauss-Seidal iterative technique as a modification of the Jacobi iterative method of solving linear system. 6

(b) Find a real root of equation $f(x) = x^3 + x^2 - 1 = 0$ by using iteration method. 5

(c) Fit a straight line to the following data regarding x as the independent variable : 5

x :	0	1	2	3	4
y :	1	1·8	3·3	4·5	6·3

(d) What is curve fitting? Explain the term least-square approximation. 1+3=4

5. (a) Why Runge-Kutta method is better than any other method? Explain briefly. 5

(b) Fit a second degree parabola to the following data taking x as the independent variable :— 6

x :	1	2	3	4	5	6	7	8	9
y :	2	6	7	8	10	11	11	10	9

(c) Define different types of error. 3

(d) Deduce the general error formula. 6

6. (a) What is the order of a differential equation? Derive the Runge-Kutta method to solve an ordinary differential equation. 2+6=8

(b) Use Range-Kutta method to approximate y, when $x = 0{\cdot}1$ and $x = 0{\cdot}2$, given that $x = 0$, when $y = 1$ and $\left(\frac{dy}{dx}\right) = (x + y)$. 6

(c) Derive Simpson's rule for numerical integration of $I = \int_a^b f(x)dx$. 6

NA - 323 - 2012 - 01

B.Sc (HONS) IN CSE, PART-III SIXTH SEMESTER EXAMINATION, 2012

CSE-323

(Numerical Analysis)

Examination Code : 616

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any four questions. Proper sequence of answer must be maintained.]

Marks

1. (a) What is forward and backward difference? Derive Newton's formula for forward interpolation. 2+6=8

(b) The area A of a circle of diameter d is given for the following values :— 6

d :	80	85	90	95	100
A :	5026	5674	6362	7088	7854

Find approximate values for the areas of circles of diameter 82.

(c) Construct a divided difference table for the following :— 3

x :	1	2	4	7	12
$f(x)$:	22	30	82	106	216

(d) Prove under suitable condition the n-th divided difference is a constant. 3

2. (a) Establish the Newton-Raphson method for solving an equation. 5

(b) Show that the Newton-Raphson iterative formula for $\sqrt{N}$ is given by $x_n = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$. Hence compute $\sqrt{17}$ correct up to four decimal places. 7

(c) Derive the iterative method to solve the equation $f(x) = 0$. 4

(d) Find the root of the equation $2x = \cos x + 3$ correct to two decimal places by using iteration method. 4

Marks

3. (a) Describe Simpson's three-eight rule for numerical integration. 6

(b) Estimate the error for numerical integration. 4

(c) Evaluate $\int_0^1 \frac{dx}{\sqrt{1+x^2}}$ by trapezoidal rule correct to three decimal places. 6

(d) Evaluate $\int_0^6 e^x\, dx$ by Simpson's $\frac{1}{3}$ rule. After finding of the integral compare the error in this case. 4

4. (a) Discuss 'Gauss-Seidel' iteration method for solving the system of linear equations. 6

(b) Solve the following system of equations by Gauss-Seidel method :— 6

$27x + 6y - z = 85$

$6x + 15y + 2z = 72$

$x + y + 54z = 110.$

(c) Define Eigen values and Eigen vectors of a matrix. Find the eigen values and eigen vectors of the matrix : 2+6=8

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}.$$

5. (a) Describe Euler Method for the solution of first order ordinary differential equation. 6

(b) Using Euler's Method solve $\frac{dy}{dx} = 1 + xy$ with initial value $y(0) = 2$. Find $y(0{\cdot}1)$, $y(0{\cdot}2)$ and $y(0{\cdot}3)$. 6

(c) Compute y (0·2) by Runge-Kutta method of 4th order for the differential equation $\frac{dy}{dx} = xy + y^2$ where initial value $y(0) = 1$. 8

6. (a) Define curve fitting. Derive least square curve fitting method. 2+6=8

(b) Use the method of least squares to fit the straight line $y = a + bx$ to the data :— 6

x :	1	2	3	4	5
y :	3	4	5	6	8

(c) Write in short about inherent, truncation and round up error. 3

(d) Find the relative error of the number 438·21 correct up to five significant figures. 3

B.Sc (HONS.) IN CSE, PART-III, SIXTH SEMESTER EXAMINATION, 2011

CSE-323

(Numerical Analysis)

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any four *questions.]*

Marks

1. (*a*) What do you mean by interpolation and extrapolation? Derive Newton's general interpolation formula for unequal intervals for $y = f(x)$. 2009 → 2(a) khata 3+5=8

(*b*) Given the set of data points satisfying the relation $y = f(x)$:— 6

khata.

x :	−1	0	3	6	7
y :	3	−6	39	822	1611

2009 → 2(b)
2011(1a)

Find the degree of $f(x)$ directly from the difference table. Also find $f(x)$ and $f(2{\cdot}5)$.

(*c*) Find the relation between divided difference and simple difference. 2009 → 2(c) 2011 → (1c) 3

(*d*) What are the differences between forward interpolation and backward interpolation? 2009 → 2(d) 3

2. (*a*) Define algebraic and transcendental equation. Explain Newton-Rapson's process for finding the roots of the equation $f(x) = 0$. 2009 → 3(a) 2+5=7

(*b*) Find the pth and recriprocal pth root of a given number N by N-R method. Hence obtain the cube root of 12. V → 326, E-1 8

(*c*) Show that the square root of $N = AB$ is given by 5

$$\sqrt{N} = \frac{S}{4} + \frac{N}{S}$$

where $S = A + B$. V pg - 326, E-12

3. (*a*) Derive general integration formula to compute $\int_a^b f(x)\,dx$, then discuss Trapezoidal rule and Simpson's $\frac{1}{3}$ rule. V-pg-350,352 8

M-106, 108

(*b*) Develop a computer program for the above method derive in (*a*) (any one). 4

(*c*) A river is 80 feet wide. The depth d (in feet) of the river at a distance x from one bank is given by the following table :— 5

x :	0	10	20	30	40	50	60	70	80
d :	0	4	7	9	12	15	14	8	3

Find approximately the area of the cross-section of the river using Simpson's $\frac{1}{3}$ rule. Titas → 304, Ex-15

(*d*) Prove that $C_k^n = C_{n-k}^n$. 2009 → 3(c) 3

4. (*a*) What is the initial value problem (IVP)? Develop Picard's method of successive approximation. 6

2010 → 2(a), 2009 → 4(a)

B-P-261, Boundary Problem

(*b*) Use Picard's method to solve $\frac{dy}{dx} = 1 + xy$ with $x_0 = 2,\ y_0 = 0$. 4

↳ 2009 → 4(c), 476-Titas Ex-15

(*c*) Develop an algorithm and implement this into a computer program to solve an ODE. 4

M-105, Q-10.

(*d*) Approximate y and z by using Picard's method for the solution of— 6

2009 → 4(c) / V pg-278

$$\frac{dy}{dx} = x + z, \quad \frac{dz}{dx} = x - y^2$$

given $y = 2, \quad z = 1$ when $x = 0$.

5. (*a*) Describe the method of factorization to solve the system of linear equations $AX = B$. 6

(*b*) Solve the following system of linear equations by factorization method :— 6

$2x + 3y + z = 9$

$x + 2y + 3z = 6$

$3x + y + 2z = 8$.

(*c*) Find the eigen values and eiven vectors of the matrix :— 8

$$A = \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \\ -1 & 1 & 2 \end{bmatrix}.$$

6. (*a*) Define curve fitting. Derive least square curve fitting method. 7

principal of

(*b*) Fit a straight line to the following data regarding x as the independent variable :— 6

V-377 ex-1

x :	0	1	2	3	4
y :	1	1·8	3·3	4·5	6·3

(*c*) Fit an exponential curve of the form $y = ab^x$ to the following data :— 7

V-381 ex-6

x :	1	2	3	4	5	6	7	8
y :	1·0	1·2	1·8	2·5	3·6	4·7	6·6	9·1

NA - 323 - 2010 - 01

B.Sc (HONS.) IN CSE, PART-III, SIXTH SEMESTER EXAMINATION, 2010

CSE-323

(Numerical Analysis)

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any four questions. Proper sequence of answer must be maintained.]

Marks

1. (a) What do you mean by interpolation? Derive the forward interpolation formula for equal intervals. 2009 (2a) M-78, 82 — 7

(b) The following table is given :— — 6

x:	0	1	2	3	4
$f(x)$:	3	6	11	18	27

What is the form of the function $f(x)$? Also find $f(3{\cdot}5)$.

V-P-31, 32
ex-26, 27
same as

(c) Define divided difference. Use Newton's divided difference formula, find the values of $f(8)$ and $f(15)$ from the following table :— V-75 — 7

x:	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

V-90-ex-3

2. (a) What is the initial value problem (IVP)? Discuss Euler's method and Modified Euler's method to solve IVP. Which method gives more accurate results and why? V-261, — 10

(b) Use Euler's modified method to compute y for $x = 0{\cdot}05$ and $x = 0{\cdot}1$. Given that, $\frac{dy}{dx} = x + y$, with the initial condition $x_0 = 0, y_0 = 1$. Give the correct result up to four decimal places. — 10

Lec-13

3. (a) What is the order of differential equation? Derive the Runge Kutta method to solve an ODE (Ordinary Differential Equation). BP-261, 263 (P-91), 264 (Modification EA — 2+6=8

(b) Derive Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rules for numerical integration. M-10 — 6

(c) Find $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule. Hence obtain the approximate value of π in each case. V-164 — 6

NA - 323 - 2010 - 02

Marks

4. (a) Explain the method of least squares for fitting a curve to approximate $y = f(x)$ for a given set of data. Khata 10

(b) Fit a straight line to following data regarding x as the independent variable :— 10

x :	0	1	2	3	4
y :	1	1·8	3·3	4·5	6·3

BP-377, Ex-1

5. (a) Describe Gaussian elimination method for the system of linear equations. V-343 / SK Das / [illegible] 325. 6

(b) Solve the system by the Gauss-Seidel method :— 7

$$\left.\begin{aligned} 27x+6y-z&=85 \\ 6x+15y+2z&=72 \\ x+y+54z&=110 \end{aligned}\right\}$$

B-P ⇒ 353, Ex-8

(c) Define Eigen Vectors of a Matrix. Discuss iterative method for determining the largest eigen value. [illegible] 429 7

6. (a) Drive Newton Rapson formula $x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$ for solving $f(x) = 0$. 2009 (1a) khata. 6

(b) Drive Jacobi Interactive method for systems of linear equations. 6

(c) Find the eigen values and eigen vectors of the matrix :— 8

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}.$$

V-368

NA - 323 - 2009 - 01

B.Sc (HONS.) IN CSE, PART-III, SIXTH SEMESTER EXAMINATION, 2009

CSE : 323

(Numerical Analysis)

Time—3 hours

Full marks—80

[N.B.—The figures in the right margin indicate full marks. Answer any **four** *questions.]*

Khata lec-4

Marks

1. (a) Define algebraic and transcendental equation. Establish Newton-Raphson formula for the solution of an equation $f(x) = 0$. 3+5=8 Lec V-292, -08-03-14
v-208

M-115 (b) Derive Bisection method. Pg-293 5

V-312 (c) Find the real root of the equation $x^2 + 4 \sin x = 0$, correct up to four place of decimals by using N–R method. same as lec-08.03.14 Q-1 7

V-55
2. (a) What do you understand by interpolation and extrapolation? Derive Newton's backward interpolation formula for equal intervals for $y = f(x)$. V-Pg-50/Lec-05.04.14, 15.03.14 3+5=8
M-72/82

(b) Given the set of data points satisfying the relation $y = f(x)$:— 6

J-copy

x :	-1	0	3	6	7
y :	3	-6	39	822	1611

Lec-23.04.14 [same as]

Find the degree of $f(x)$ directly from the difference table. Also find $f(x)$ and $f(2{\cdot}5)$.

V-82 (c) Find the relation between divided difference and simple difference. V-Pg-82 3

M-80 (d) What are the differences between forward interpolation and backward interpolation? Lec-13.03.14 & 15.03.14 3

3. (a) Define numerical integration. Establish Simpson's $\frac{1}{3}$ rule to integrate $f(x)$. M-106, 108 2+6=8

V-169 (b) A curve is drawn to passing through the points given by the following table :— 6

x :	1	1·5	2	2·5	3	3·5	4
y :	2	2·4	2·7	2·8	3	2·6	2·1

Find the area bounded by the curve, the x axis and the lines $x + 1 = 0$, $x = 4$.

(c) Prove that $C_k^n = C_{n-k}^n$. V-Pg-255 6

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M.

4. (a) What do you mean by order and degree of an ODE? Explain with examples. lec-24.04.14 — 6
M-05

(b) Deduce Picard's successive aproximation method to solve an ODE. lec-24.04.14 — 6
M-06

(c) Approximate y and z by using Picard's method for the solution of

V-276 $\frac{dy}{dx} = x + z$, $\frac{dz}{dx} = x - y^2$, same as lec-24.04.14 9DEy

given that $y = 2$, $z = 1$ when $x = 0$. — 4

(d) Develop an algorithm and implement this into a computer program to solve an ODE. ~~V. pg-345~~ M-105 — 6

5. (a) Describe the method of factorization to solve the system of linear equation $AX = B$. V. pg-345 M-110 — 6

(b) Solve the following system by factorization method :—

M-123
$$\begin{aligned} 2x + 3y + z &= 9 \\ x + 2y + 3z &= 6 \\ 3x + y + 2z &= 8. \end{aligned}$$
V pg-352, Ex-7 — 8

V-368 (c) Find the eigen values and the corresponding eigen vectors of the matrix :

$$A = \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \\ -1 & 1 & 2 \end{bmatrix}.$$
V pg-369 [same

M-126, vida

6. (a) Define curve fitting. Derive least square curve fitting method. V. pg-374, 373 — 2+6=8

(b) Use the method of least squares to fit the straight line $y = a + bx$ to the data : V-pg-377, Ex-1 [same of] — 6

M-127

x :	1	2	3	4	5
y :	3	4	5	6	8

Kuato Lec-2

(c) Write in short about inherent, truncation and round up error. lec-22.07.14 — 3

Kuato

(d) Find the relative error of the number 438·21 correct up to five significant figures. Lec-22.07.14 → Q-1 (Relative — 3