Bachelor of Computer Application (B.C.A.) Semester—II Examination

NUMERICAL METHODS

Paper—III

Time : Three Hours]   [Maximum Marks : 50

N.B. :— (1) All questions are compulsory and carry equal marks.

(2) Draw neat and labelled diagram wherever necessary.

EITHER

1. (A) Use the false position method to find a root of the equation $f(x) = x^2 - x - 2 = 0$ in the range $1 < x < 3$.   5

   (B) Prove that the bijection method is linearly convergent.   5

OR

   (C) Use Secant method to find root of the equation $f(x) = x^3 - x - 1$ when $x_1 = 1$ and $x_2 = 2.5$

   (D) Use Newton-Raphson method to find the root of the equation $x^2 - 5x + 6 = 0$. Given that $x_0 = 5$.   5

EITHER

2. (A) Solve the following system of equations using Gauss-Jordan method :

   $x_1 + 2x_2 - 3x_3 = 4$

   $2x_1 + 4x_2 - 6x_3 = 8$

   $x_1 - 2x_2 + 5x_3 = 4$.   5

   (B) What are the possibilities of a solution of system of linear equations ? Explain each by giving an example.   5

OR

   (C) Use Gauss elimination method to solve the system of equations :

   $2x_1 + x_2 + x_3 = 10$

   $3x_1 + 2x_2 + 3x_3 = 18$

   $x_1 + 4x_2 + 9x_3 = 16$.   5

   (D) Explain matrix inversion method to find solution of n linear equations in n unknowns.   5

EITHER

3. (A) Given the data table, fit a power function model of the form $y = ax^b$.

x :	1	2	3	4	5
y :	0.5	2	4.5	8	12.5

5

(B) What is spline ? Explain spline interpolation in detail.

5

OR

(C) Use Lagrange's interpolation formula to find the value of y, when x = 2 for the data given below :

x :	0	1	3	4
y :	−12	0	6	12

5

(D) Derive the linear interpolation formula for polynomial of first order.

5

EITHER

4. (A) Estimate y(2) using Adams-Bashforth moulton method when :

$$y'(x) = \frac{2y}{x} \text{ with } y(1) = 2$$

given h = 0.25 y(1.25) = 3.13

y(1.5) = 4.50, y(1.75) = 6.13

5

(B) Evaluate $\int_{0}^{1} \frac{dx}{1+x}$, using trapezoidal rule take h = 0.1.

5

OR

(C) Given the initial value problem :

$$\frac{dy}{dx} = y - x \text{ with } y(0) = 2$$

Find y(0.1) and y(0.2) by using Runge-Kutta second order method.

5

(D) Derive the formula for Simpson's 1/3rd rule.

5

5. (A) Explain the terms :

    (i) Polynomial equation

    (ii) Transcendental equation.

2½

(B) Explain the term : Round off error and refinement.

2½

(C) Explain interpolation with equidistant points.

2½

(D) Use Simpson's 3/8 rule to evaluate, $\int_{1}^{2}(x^3+1)dx$.

2½

Bachelor of Computer Application (B.C.A.) Semester—II (C.B.S.) Examination

NUMERICAL METHODS

Paper-III

Time   Three Hours]

[Maximum Marks : 50

N.B. :— (1) ALL questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Discuss the convergence of Bisection Method. 5

   (b) Using False Position method, find the root of the equation :

   $x^3 + x - 2 = 0$, in the range $1 < x < 3$. 5

OR

   (c) Use Newton's Raphson method find roots of equation :

   $x^2 - 3x + 2 = 0$ in the vicinity of $x = 0$. 5

   (d) Use the Secant method to compute a root of an equation :

   $4x^2 - 2x - 6 = 0$ 5

EITHER

2. (a) Explain Gauss Elimination method with example. 5

   (b) Find the inverse of given motive using Gaussian method :

   $$A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$$ 5

OR

   (c) Explain Gauss-Jordan method with example. 5

   (d) Solve the following equations using Gauss-Jordan method :

   $2x + y + 4z = 12$

   $8x - 3y + 2z = 1$

   $4x + 11y - z = 33$ 5

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EITHER

3. (a) Derive the Lagrange's Interpolation formula for the set of $(n + 1)$ Points

   (b) Use least square regression to fit a straight line to the data :   5

x	0 3 2	4	6	8	12	16	20
y	10	12	18	22	20	30	26	30

OR   5

   (c) Using Lagrange's interpolation formula, find a polynomial to fit to data

x	0	1	3	4
y	−12	0	6	12

   Find the value of y when x = 2.

   (d) Explain Spline interpolation with example.   5

EITHER   5

4. (a) Explain Trapezoidal Rule. Evaluate $f(x) = \int_0^1 \frac{dx}{3 + x^2}$ with h = 0.2 using Trapezoidal Rule.   5

   (b) Explain Simpson's 1/3 Rule. Evaluate $f(x) = \int_0^{\pi/2} \sin x \, dx$ using Simpson's 1/3 Rule by dividing the range into 6 equal parts.   5

OR

   (c) Explain Simpson's 3/8 Rule. Evaluate $\int_0^1 \frac{1}{1 + x}$ by taking $h = \frac{1}{6}$ 5

   (d) Explain second order Runge-Kutta method with example.   5

5. Attempt ALL :

   (a) Write a note on polynomial equation and iterative methods   2½

   (b) Explain matrix inversion method.   2½

   (c) What is forward and backward difference ?   2½

   (d) Write a note on Milne-Simpson method   2½

Bachelor of Computer Application (B.C.A.) Semester—II (C.B.S.) Examination

NUMERICAL METHODS

Paper—III

Time : Three Hours] [Maximum Marks : 50

Note :— (1) All questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Find a root of the equation $x^2 - 4x - 10 = 0$ using Bisection Method. 5

   (b) Find a root of the equation $f(x) = x^2 - 3x - 2 = 0$ in the vicinity of $x = 0$ using Newton-Raphson method. 5

OR

(c) Derive the false position formula for evaluating a root of a non-linear equation. 5

(d) Use Secant Method to compute a root of an equation $4x^2 - 2x - 6 = 0$. 5

EITHER

(a) What is Pivoting ? Distinguish between complete pivoting and partial pivoting. 5

(b) Use Gauss-Jordan method for system of linear equation :

$$2x_1 + 4x_2 - 6x_3 = -8$$
$$x_1 + 3x_2 + x_3 = 10$$
$$2x_1 - 4x_2 - 2x_3 = -12.$$

5

OR

(c) What are the possibilities of a solution of a system of linear equations ? Explain each by giving an example. 5

(d) Solve the following 3 × 3 system using the basic Gauss Elimination Method :

$$3x_1 + 6x_2 + x_3 = 16$$
$$2x_1 + 4x_2 + 3x_3 = 13$$
$$x_1 + 3x_2 + 2x_3 = 9.$$

5

EITHER 5

(a) What is spline interpolation ? Discuss with linear splines.

(b) Fit a straight line to the following data : 5

x :	0	1	2	3	4
y :	1	1.8	3.3	4.5	6.3

5

OR 5

(c) What is multiple linear regression ? Explain.

(d) Use the method of least square fit to fit a curve of the form $y = x^{ax}$ and solve the following :

x :	1	2	3	4
y :	1.65	2.70	4.50	7.35

5

(Contd.)

1

EITHER

4. (a) What is Numerical Integration ? Derive formula for Trapezoidal rule. 5

   (b) Solve $\int_0^6 \dfrac{dx}{1+x^2}$ using Simpson 1/3 Rule where h = 1. 5

   OR

   (c) Use Trapezoidal Rule to compute $I = \int_0^1 \dfrac{1}{1+x} dx$, correct to three decimal places, assume h = 0.2. 5

   (d) Find the value of $\int_1^2 \dfrac{dx}{x}$ by using Simpson 3/8 rule. Value of h = 0.25 and also find the error. 5

5. Attempt **ALL** :

   (a) Explain the following :

      (i) Polynomial equation

      (ii) Transcendental equation. 2½

   (b) Explain forward and backward elimination method. 2½

   (c) Derive linear Interpolation formula. 2½

   (d) Evaluate $\int_0^1 \cos x\, dx$ by using Trapezoidal where h = 0.25. 2½

NRT/KS/19/2221

Bachelor of Computer Application (B.C.A.) Semester—II Examination

NUMERICAL METHODS

Paper—III

Time : Three Hours]   [Maximum Marks : 50

Note :— (1) **ALL** questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Find the root of the equation :

$f(x) = x^2 - 5x + 6 = 0$ in the vicinity of x = 5 using Newton-Raphson method.   5

(b) Illustrate Bisection method to find root of equation.   5

OR

(c) Use false position method to find a root of equation $f(x) = x^2 - 2x - 2 = 0$.   5

(d) Derive formula for Secant method to find root of equation.   5

EITHER

2. (a) Solve by Gauss-Jordan Reduction method :—

$2x_1 + 4x_2 - 6x_3 = - 8$

$x_1 + 3x_2 + x_3 = 10$

$2x_1 - 4x_2 - 2x_3 = - 12$ 5

(b) Discuss the Gauss elimination method with pivoting to solve the linear system of equations.   5

OR

(c) Solve by using Basic Gauss elimination method :

$x_1 + 2x_2 + 3x_3 = 8$

$2x_1 + 4x_2 + 9x_3 = 8$

$4x_1 + 3x_2 + 2x_3 = 2$ 5

(d) Explain Matrix inversion method to find solution of n linear equations in n unknowns, and use this method to find solution of following equations :—

$3x + 4y = 50$

$5x + 3y = 65$.   5

EITHER

3. (a) What is least square regression ? Derive normal equations for evaluating the parameters a and b to fit data to straight line y = a + bx.   5

(b) Estimate f(1.35) using Lagrange's interpolation formula :

x	:	1.2	1.3	1.4	1.5
f(x)| :	1.063	1.091	1.119	1.45	5

OR

(c) Fit a straight line $y = a_0 + a_1 x$ to the data :

x	:	0	1	2	3	4
y	:	1.0	2.9	4.8	6.7	8.6	5

(d) What is multiple linear regression ? Explain.   5

EITHER

4.　(a)　Use Simpson's 3/8 rule to evaluate $\int_0^2 (x^3 + 1)\, dx$, for four sample points. 　　5

　　(b)　Use fourth order Runge-Kutta method to estimate y(0.4) when $y'(x) = x^2 + y^2$ with y(0) = 0. Assume h = 0.2. 　　5

OR

　　(c)　Explain Milne-Simpson multistep method for solving ordinary differential equations. 　　5

　　(d)　Using Trapezoidal rule of Integration find approximately the area of cross section of a river from the following table of distance x and the depth y :

x	:	0	10	20	30	40	50	60	70	80	
y	:	0	4	7	9	12	15	14	8	3	5

5.　(a)　Explain the following equation :—

　　　(i)　Polynomial equation

　　　(ii)　Transcendental equation. 　　2½

　　(b)　Explain :—

　　　(i)　System has a unique solution.

　　　(ii)　System has no solution. 　　2½

　　(c)　Explain Linear interpolation. 　　2½

　　(d)　Discuss Trapezoidal Rule. 　　2½

NJR/KS/18/3221

Bachelor of Computer Application (B.C.A.) Semester—II (C.B.S.) Examination

NUMERICAL METHODS

Paper—III

Time : Three Hours] [Maximum Marks : 50

Note :— (1) **All** questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Find a root of the equation $x^2 - 4x - 10 = 0$ using Bisection Method. 5

   (b) Find a root of the equation $f(x) = x^2 - 3x - 2 = 0$ in the vicinity of $x = 0$ using Newton-Raphson method. 5

   OR

   (c) Derive the false position formula for evaluating a root of a non-linear equation. 5

   (d) Use Secant Method to compute a root of an equation $4x^2 - 2x - 6 = 0$. 5

   EITHER

2. (a) What is Pivoting ? Distinguish between complete pivoting and partial pivoting. 5

   (b) Use Gauss-Jordan method for system of linear equation :

   $$2x_1 + 4x_2 - 6x_3 = -8$$
   $$x_1 + 3x_2 + x_3 = 10$$
   $$2x_1 - 4x_2 - 2x_3 = -12.$$ 5

   OR

   (c) What are the possibilities of a solution of a system of linear equations ? Explain each by giving an example. 5

   (d) Solve the following 3×3 system using the basic Gauss Elimination Method :

   $$3x_1 + 6x_2 + x_3 = 16$$
   $$2x_1 + 4x_2 + 3x_3 = 13$$
   $$x_1 + 3x_2 + 2x_3 = 9.$$ 5

   EITHER

3. (a) What is spline interpolation ? Discuss with linear splines. 5

   (b) Fit a straight line to the following data :

x :	0	1	2	3	4
y :	1	1.8	3.3	4.5	6.3

   5

   OR

   (c) What is multiple linear regression ? Explain. 5

   (d) Use the method of least square fit to fit a curve of the form $y = ae^{bx}$ and solve the following :

x :	1	2	3	4
y :	1.65	2.70	4.50	7.35

   5

EITHER

4. (a) What is Numerical Integration ? Derive formula for Trapezoidal rule.   5

    (b) Solve $\int_0^6 \dfrac{dx}{1+x^2}$ using Simpson 1/3 Rule where h = 1.   5

OR

    (c) Use Trapezoidal Rule to compute $I = \int_0^1 \dfrac{1}{1+x}\,dx$, correct to three decimal places, assume h = 0.2.   5

    (d) Find the value of $\int_1^2 \dfrac{dx}{x}$ by using Simpson 3/8 rule. Value of h = 0.25 and also find the error.

                5

5. Attempt **ALL** :   http://www.rtmnuonline.com

    (a) Explain the following :

        (i)   Polynomial equation

        (ii) Transcendental equation.   2½

    (b) Explain forward and backward elimination method.   2½

    (c) Derive linear Interpolation formula.   2½

    (d) Evaluate $\int_0^1 \cos x\,dx$ by using Trapezoidal where h = 0.25.   2½

Bachelor of Computer Application (B.C.A.) Semester—II (C.B.S.) Examination

NUMERICAL METHODS

Paper–III

Time : Three Hours]   [Maximum Marks : 50

N.B. :— (1) **ALL** questions are compulsory and carry equal marks.

        (2) Assume the data wherever necessary.

EITHER

1. (a) Discuss the convergence of Bisection Method.   5

   (b) Using False Position method, find the root of the equation :

      $x^2 - x - 2 = 0$, in the range $1 < x < 3$.   5

OR

   (c) Use Newton's Raphson method find roots of equation :

      $x^2 - 3x + 2 = 0$ in the vicinity of $x = 0$.   5

   (d) Use the Secant method to compute a root of an equation :

      $4x^3 - 2x - 6 = 0$ 5

EITHER

2. (a) Explain Gauss Elimination method with example.   5

   (b) Find the inverse of given motive using Gaussian method :

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$$

      5

OR

   (c) Explain Gauss-Jordan method with example.   5

   (d) Solve the following equations using Gauss-Jordan method :

      $2x + y + 4z = 12$

      $8x - 3y + 2z = 1$

      $4x + 11y - z = 33$ 5

EITHER

3. (a) Derive the Lagrange's Interpolation formula for the set of (n + 1) Points.   5

   (b) Use least square regression to fit a straight line to the data :

x	0	2	4	6	8	12	16	20
y	10	12	18	22	20	30	26	30

                                                                     5

OR

   (c) Using Lagrange's interpolation formula, find a polynomial to fit to data :

x	0	1	3	4
y	–12	0	6	12

       Find the value of y when x = 2.   5

   (d) Explain Spline interpolation with example.   5

EITHER

4. (a) Explain Trapezoidal Rule. Evaluate $f(x) = \int_0^1 \frac{dx}{1 + x^2}$ with h = 0.2 using Trapezoidal Rule.   5

   (b) Explain Simpson's 1/3 Rule. Evaluate $f(x) = \int_0^{\pi/2} \sin x \, dx$ using Simpson's 1/3 Rule by dividing the range into 6 equal parts.   5

OR

   (c) Explain Simpson's 3/8 Rule. Evaluate $\int_0^1 \frac{1}{1 + x}$ by taking $h = \frac{1}{6}$.   5

   (d) Explain second order Runge-Kutta method with example.   5

5. Attempt **ALL** :

   (a) Write a note on polynomial equation and iterative methods.   2½

   (b) Explain matrix inversion method.   2½

   (c) What is forward and backward difference ?   2½

   (d) Write a note on Milne-Simpson method.   2½

OR

(c) Explain Milne-Simpson multistep method for solving ordinary differential equations. 5

(d) Use Trapezoidal Rule to compute

$$I = \int_{0}^{1} \frac{1}{1+x} dx$$

correct to three decimal places.

Assume h = 0.125. 5

5. Attempt **ALL** :—

(a) What is bisection method ? Explain. 2½

(b) Write a short note on Round off errors and refinement. 2½

(c) What is least square method ? Explain ill-conditioning in least square methods. 2½

(d) Use Simpson's 3/8 Rule to evaluate $\int_{1}^{2} (x^3 +1) dx$.

2½

Bachelor of Computer Application (B.C.A.)
Semester—II (C.B.S.) Examination
NUMERICAL METHODS
Paper—III

Time—Three Hours]　　　　[Maximum Marks—50

Note :— (1) All questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Prove that Newton-Raphson method have a quadratic convergence. 5

(b) Use the secant method to estimate the root of the equation $x^2 - 4x - 10 = 0$ with the initial estimates of $x_1 = 4$ and $x_2 = 2$. 5

OR

(c) Use the false position method to find a root of the function $f(x) = x^2 - x - 2 = 0$ in the range $1 < x < 3$. 5

(d) Find the root of the equation

$f(x) = x^2 - 3x + 2 = 0$ in the vicinity of x = 0 using Newton-Raphson method. 5

EITHER

2. (a) Discuss matrix inversion method. 5

   (b) Use Gauss elimination method to solve :

   $2x_1 + x_2 + x_3 = 10$

   $3x_1 + 2x_2 + 3x_3 = 18$

   $x_1 + 4x_2 + 9x_3 = 16$ 5

OR

   (c) What is ill-conditioned system ? Describe the problem of ill-condition for two equation system. 5

   (d) Solve the system using Gauss-Jordan method :

   $2x_1 + 4x_2 - 6x_3 = -8$

   $x_1 + 3x_2 + x_3 = 10$

   $2x_1 - 4x_2 - 2x_3 = -12$ 5

EITHER

3. (a) What is spline interpolation ? Discuss with linear splines. 5

   (b) Estimate the value of sin θ at θ = 25° using following table :

q	sin q
10	0.1736
20	0.3420

q	sin q
30	0.5000
40	0.6428
50	0.7660

5

OR

   (c) How does transcendental equation fit using regression ? 5

   (d) Given the table of data, obtain a regression plane to fit the data :

x	1	2	3	4
z	0	1	2	3
y	12	18	24	30

5

EITHER

4. (a) Derive Simpson's 1/3rd rule of numerical integration. 5

   (b) Use fourth-order Runge-Kutta method to estimate $y(0.4)$ when $y'(x) = x^2 + y^2$ with $y(0) = 0$. Assume $h = 0.2$. 5

NTK/KW/15 – 5965

Second Semester Bachelor of Computer Application (BCA) Examination

NUMERICAL METHODS

Paper – III

Time : Three Hours]　　　　　　　　[Max. Marks : 50

N. B. : (1) All questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Discuss following with example :—

   (i) Algebraic equations.

   (ii) Polynomial equations.　　　　　5

   (b) Find the root of equation $f(x) = x^2 - 3x + 2$ in the vicinity of $x = 0$ using Newton Raphson method.

   　　　　　5

   OR

   (c) Explain starting iterative process to determine either an approximate value of a root or a search interval that contains a root.　　　　　5

   (d) Find the root of the equation $y(x) = x^3 - 2x - 5 = 0$ which lies between 2 and 3.　　　　　5

EITHER

2. (a) Explain Gauss Elimination method in detail for solving system of n linear equations in n unknowns.　　5

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

$2x + y + 2 = 10$

$3x + 2y + 32 = 18$

$x + 4y + 92 = 16$ 5

OR

(c) Discuss Gauss elimination with pivoting method.   5

(d) Solve the following equations.

$2x_1 + x_2 = 25$

$2.001x_1 + x_2 = 25.01$

and hence discuss the effect of ill–conditioning.

      5

EITHER

3.   (a) Derive Lagrange's interpolation formula.   5

    (b) Fit a straight line to the following set of data :—

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

      5

OR

    (c) What is multiple linear regression ? Explain.   5

    (d) Given the data table, fit a power–function model of the form $y = ax^b$

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

      5

EITHER

4. (a) What is numerical integration ? Derive formula for Trapezoidal rule. 5

(b) Given the equation $y^1(x) = \dfrac{2y}{x}$ with $y(1) = 2$

Estimate $y(2)$ using the Milne–Simpson predictor-corrector method. Assume $h = 0.25$. 5

OR

(c) Explain Runge–Kulta method for solving ordinary differential equations. 5

(d) Compute the integral $\displaystyle\int_{0}^{\pi/2} \sqrt{\sin(x)}\ dx$

using Simpson's $\frac{1}{3}$ rule for $n = 4$. 5

5. Attempt any **ten** :—

(a) What is transcendental equation ?

(b) Write formula for regula-falsi method to trace root of equation.

(c) What is stopping criteria in iterative process ?

(d) What is forward and back elimination ?

(e) What are inconsistent equations ?

(f) Explain use of augmented matrix in finding inverse matrix.

(g) Explain divided difference used in interpolation.

(h) What is curve fitting ?

(i) How is ill conditioning problem arise in least squares regression methods ?

(j) What is Gaussian integration ?

(k) Write the formula for Simpson's 3/8 rule.

(l) Write Adams–Bashforth Predictor corrector formula.

1×10

Bachelor of Computer Application (B.C.A.) Semester—II (C.B.S.) Examination

NUMERICAL METHODS

Paper—III

Time : Three Hours]   [Maximum Marks : 50

N.B. :— (1) **ALL** questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Derive the formula for bisection method to find a root of equation.   5

(b) Use the false position method to find a root of the equation $f(x) = x^2 – x – 2 = 0$ in the range $1 < x < 3$.   5

OR

(c) Use the Secant method to estimate the root of the equation $x^2 – 4x – 10 = 0$ with the initial estimates $x_1 = 4$ and $x_2 = 2$.   5

(d) Find the root of the equation $f(x) = x^3 – 2x – 5 = 0$ using Newton-Raphson method.   5

EITHER

2. (a) Use Gauss-Jordan method for system of Linear equations :

$2x_1 + 4x_2 – 6x_3 = – 8$

$x_1 + 3x_2 + x_3 = 10$

$2x_1 – 4x_2 – 2x_3 = –12$ 5

(b) Using Gauss elimination with partial pivoting, solve the following system of equations :

$2x_1 + 2x_2 + x_3 = 6$

$4x_1 + 2x_2 + 3x_3 = 4$

$x_1 – x_2 + x_3 = 0$ 5

OR

(c) Discuss the Matrix inversion method. 5

(d) Solve the following system of linear equations by Gauss elimination method :

$$3x_1 + 6x_2 + x_3 = 16$$

$$2x_1 + 4x_2 + 3x_3 = 13$$

$$x_1 + 3x_2 + 2x_3 = 9$$ 5

EITHER

3. (a) Find the Lagrange interpolation Polynomial to fit the following data :

i	0	1	2	3
x_i	0	1	2	3
$e^{x_i} - 1$	0	1.7183	6.3891	19.0855

Hence estimate the value of $e^{1.5}$. 5

(b) Derive Linear interpolation formula. Also determine square root of 2.5 from the following table :

x	1	2	3	4	5
$f(x) = \sqrt{x}$	1	1.4142	1.7321	2	2.2361

5

OR

(c) Use the least square regression to fit a straight line to the data :

x	0	2	4	6	8	12	16	20
y	10	12	18	22	20	30	26	30

5

(d) Given the table of data :

x	1	2	3	4
y	0	1	2	3
z	12	18	24	30

Obtain the regression plane to fit the data. 5

EITHER

4. (a) Compute the integral $\int\limits_{0}^{\pi/2} \sqrt{\sin x}\ dx$ using Simpson's 1/3 rule for n = 4 and n = 6. 5

(b) Using Runge-Kutta Fourth order method estimate y(0.4) when :

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

Assume h = 0.2. 5

OR

(c) Derive the formula for composite Trapezoidal rule for numerical integration. 5

(d) Estimate y(2) using Adams-Bashforth-Moulton method when :

$$y'(x) = \frac{2y}{x} \text{ with } y(1) = 2$$

Given : h = 0.25

$$y(1.25) = 3.13, \quad y(1.5) = 4.50$$

$$y(1.75) = 6.13$$ 5

5. Attempt **all** the following :

(a) How does the Secant Method compare with the Newton-Raphson method ? 2½

(b) Explain about ill conditioned system with an example. 2½

(c) State whether the following Piecewise Polynomial is spline or not :

$$f(x) = \begin{cases} x^2 + 1 & 0 \le x \le 1 \\ 2x^2 & 1 \le x \le 2 \\ 5x - 2 & 2 \le x \le 3 \end{cases}$$ 2½

(d) Using Trapezoidal rule, evaluate :

$$\int_1^3 \frac{dx}{x}, \text{ for } n = 4$$ 2½

Bachelor of Computer Application (B.C.A.) Semester—II Examination

NUMERICAL METHODS

Paper—III

Time : Three Hours]   [Maximum Marks : 50

Note :—(1) **All** questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

(3) Draw neat and labelled diagram wherever necessary.

(4) Use of scientific calculator is not allowed.

EITHER

1.   (a) Discuss the following with example :

(i)   Polynomial equation

(ii) Transcendental equation.   5

(b) Find the root of equation $f(x) = x^3 - x - 1 = 0$ by using Bisection Method.   5

OR

(c) Use Newton-Raphson Method to find the roots of equation $f(x) = x^3 - 2x - 5 = 0$.   5

(d) Distinguish between the Secant and Regula Falsi method.   5

EITHER

2.   (a) Solve the following system of equation by using Gauss Elimination method :

$2x + y + z = 10$

$3x + 2y + 3z = 18$

$x + 4y + 9z = 16$ 5

(b) Solve the equations using Gauss Jordan Method :

$x + y + z = 9$

$2x - 3y + 4z = 13$

$3x + 4y + 5z = 40$ 5

OR

(c) What are the possibilities of a solution of a system of linear equations ? Explain each by giving an example.   5

(d) Solve the following system of equations using Gauss Elimination with partial pivoting :

$x_1 + 2x_2 + 3x_3 = 8$

$2x_1 + 4x_2 + 9x_3 = 8$

$4x_1 + 3x_2 + 2x_3 = 2$ 5

EITHER

3.   (a) Derive Lagrange's interpolation formula.   5

(b) Fit a straight line to the data given below :

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

OR

(c) Use the method of least square, to fit a curve of the form $y = ab^x$ to the following data :

      x :   1   2   3   4

      y :   4   11   35   100   5

(d) State whether the following piecewise polynomial is spline or not :

$$f(x) = \begin{cases} x + 1 & -1 \le x \le 0 \\ 2x + 1 & 0 \le x \le 1 \\ 4 - x & 1 \le x \le 2 \end{cases}$$

                                               5

EITHER

4. (a) Find the value of $\int_{1}^{2} \dfrac{dx}{x}$ by using Simpson 3/8 rule using h = 0.25.   5

(b) Evaluate $\int_{0}^{1} \cos x \, dx$ by using Trapezoidal; using value of h = 0.25.   5

OR

(c) Solve $\int_{0}^{6} \dfrac{dx}{1 + x^2}$; using Simpson 1/3 rule. Divide the interval into 6 subintervals.   5

(d) Given the initial value problem :

$$\frac{dy}{dx} = y - x \text{ with } y(0) = 2$$

find y(0.1) and y(0.2) by using Runge-Kutta second order method.   5

5. Attempt **ALL** :

(a) Give the limitations of Newton-Raphson method.   2½

(b) What is forward and backward elimination ? Explain with example.   2½

(c) Derive the formula for linear interpolation.   2½

(d) What is Gaussian integration ? Explain.   2½